SEP 05 1991

LINCOLN
APPLIED GEOLOGY, INC.
ENVIRONMENTAL CONSULTANTS

September 4, 1991

Mr. William Sellinger
Bradford Oil Company
P.O. Box 394
Bradford, Vermont 05033

RE: Summary of Contaminant Investigation and Remediation Program at Dean's Mobil, Bethel, Vermont

Dear Mr. Sellinger:

Enclosed please find a copy of the above captioned report. If you have any questions or concerns, please contact Bill Norland at 453-4384.

Sincerely,

Susan D'Avignon
Administrative
Assistant

/smd

Enclosures

cc: Richard Spiese

RD # 1 Box 710 • Bristol, Vermont 05443 • (802) 453-4384 • FAX (802) 453-5399

Summary of Contaminant Investigation And Remediation Program At Dean's Mobil Bethel, Vermont

Prepared by:

William Norland, Hydrogeologist
Lincoln Applied Geology, Inc.
RD#1 Box 710
Bristol, Vermont 05443

Reviewed by:

Stephen Revell, CPGA
Lincoln Applied Geology, Inc.
RD#1 Box 710
Bristol, Vermont 05443

TABLE OF CONTENTS

Lincoln Applied Geology, Inc.
Environmental Consultants
RD # 1 Box 710 • Bristol, Vermont 05443 • (802) 453-4384 • FAX (802) 453-5399

Introduction

The following report provides a chronological history and data summary of the contaminant investigation and sequence of events that resulted in the installation, operation, and monitoring of the gasoline contamination remediation systems at the Dean's Mobil site in Bethel, Vermont.

Background Site History

On June 19, 1991, a delivery of 2,000 gallons of special unleaded gasoline was made to Dean's Mobil located on Main Street (Route 12) in the Town of Bethel, Vermont. The Dean's Mobil site is shown on the General Location Map presented as **Figure 1**. The following day, June 20th, approximately 600 gallons of gasoline was pumped from the 4,000 gallon single wall steel underground storage tank (UST) and sold during business hours. When a product inventory check was made the next day on June 21st, the gasoline tank was found to be completely empty. Visual observation through the tank fill pipe revealed a small hole in the tank bottom directly beneath the fill pipe, and inventory records indicated that approximately 1,400 gallons of gasoline were lost to the environment. The location of the tank hole directly beneath the fill pipe suggests that the hole developed gradually over the years in response to constant wear caused by the bottom of the tank stick during the collection of product inventory data. The UST is owned by Bradford Oil Company of Bradford, Vermont.

On June 21, 1991, Mr. William Sellinger of Bradford Oil Company (BOC) called the Vermont Department of Environmental Conservation (VDEC) Sites Management Section (SMS) to report the release of approximately 2,000 gallons of unleaded gasoline to the environment. The VDEC requested that BOC contract a qualified consultant to investigate and remediate the gasoline contamination. BOC contracted Lincoln Applied Geology, Inc. (LAG) the same day. Mr. Richard Spiese of VDEC SMS immediately initiated a background search of State files in order to determine the locations of environmental receptors in the vicinity of the site. LAG contracted Green Mountain Boring Company, Inc. (GMBC) of Barre, Vermont to begin the drilling and installation of ground water monitoring wells on-site. Richard Spiese met on-site with Steve Revell and Bill Norland of LAG on Monday, June 24th to determine a proper course of action for the investigation and remediation of the gasoline contamination problem.

Background research regarding potential environmental contaminant receptors indicated that the Town of Bethel public drinking water is supplied by the Bethel Water Department from two sand and gravel municipal production wells, Well #1 and Well #2, located on the west banks of the Third Branch of the White River and the White River, respectively. Well #1 is used as an emergency backup and Well #2 is the primary production well.

911058
and
961058

Lincoln Applied Geology
Environmental Consulta
RD # 1 Box 710 • Bristol, Vermont 05443 • (802) 453-4384 • FAX (802) [illegible]

Each well and their respective aquifer protection areas (APA) are shown in **Figure 2**. Well #1 is situated approximately 3,100 feet northwest and upriver of the site, while Well #2 is situated approximately 1,500 feet southwest of the site, a short distance upstream of the confluence of the Third Branch of the White River and the White River, and only 1,500 feet south-southwest of the site. Only Well #2 could potentially be impacted by subsurface petroleum contamination migrating downgradient from the site. However, this is somewhat doubtful due to the well's location on the opposite side of the river upstream of the site and the confluence of the two rivers.

Site Location

Dean's Mobil is a full-service automotive repair and gasoline service station owned and operated by Robert Dean. Located on the western side of Main Street (State Route 12), the site is approximately 700 feet northwest of the intersection of State Route 107 and State Route 12 in the Town of Bethel, Vermont. The property is located on **Figure 1**. A detailed site map showing pertinent buildings and subsurface structures is included as **Figure 3**.

Topographically the site is level and situated at an elevation of 570 feet above mean sea level (MSL). Abutting the site to the northwest is Dean's Auto Parts, a retail automotive parts store also owned and operated by Robert Dean. To the east and north across Main Street are the Bethel Public Library, residential homes and apartments, the Guy Wilson Agency, Inc. (insurance and real estate), and the New England Telephone Company. The land surface behind these properties rises sharply to elevations exceeding 1,000 feet. Abutting the site to the southeast is the Spaulding Press, a book publisher. To the south and west the land slopes steeply down to the property and railroad tracks of the Central Vermont Railroad (CVRR) 17 feet below. Further to the south and west the land drops steeply down another 20 feet to level property of the Hill's Fuel Company, located on the east bank of the Third Branch of the White River a short distance upstream of its confluence with the White River. Topographic relief from Dean's Mobil to Hill's Fuel Company is approximately 37 feet.

The majority of the Dean's Mobil site is paved with asphalt and occupied by the service station building. A narrow unpaved strip of grass and soil exists at the rear of the site along the break in slope extending down to the CVRR property.

Precipitation falling onto the site will flow overland toward the east and into a storm sewer grate located on the west side of Main Street, although a small portion will flow to the west toward the unpaved hillside sloping down to the CVRR property. Ground water beneath the site originates as precipitational recharge in the hills to the northeast and flows in a southwesterly direction toward the Third Branch of the White River.

Lincoln Applied Geology, Inc.
Environmental Consultants
RD # 1 Box 710 • Bristol, Vermont 05443 • (802) 453-4384 • FAX (802) 453-5399

Subsurface Geology

Geologic deposits present beneath the Dean's Mobil site, CVRR property, and Hills Fuel Co. property include two types, unconsolidated surficial sedimentary deposits overlying consolidated metamorphosed bedrock. The surficial geology of the area was mapped by D.P. Stewart and compiled by C.G. Doll for publication in 1970 as the "Surficial Geologic Map of Vermont." At the site and CVRR property, surficial geologic deposits are described as glaciolacustrine littoral pebbly sand, whereas recent river alluvium is found at the Hills Fuel Co. property.

Bedrock geology in the area was mapped by E.H. Ern, Jr. and published in 1963 as Bulletin No. 21, "Bedrock Geology of the Randolph Quadrangle, Vermont." Bedrock was encountered in subsurface borings at the site and on CVRR property, and is described by Ern as the Barnard Formation, a metamorphosed volcanic rock unit of probable Ordovician age. Ern further describes the Formation as biotite gneiss, hornblende gneiss, locally calcareous, garnetiferous hornblende gneiss, greenstone, and amphibolite. Rock samples from subsurface borings indicate that biotite gneiss is prevalent beneath the site. No outcrops of bedrock are present on-site. However, to the northeast on the slopes of Shaw Hill bedrock outcrops can be found.

Business History

Interviews with the current proprietors of Dean's Mobil indicate that the site has been a full-service automotive repair and gasoline service station since at least the early 1930's. Also on the west side of Main Street immediately northwest of the site is the former location of the Bethel Inn block . Presently the Dean's Auto Parts building occupies part of this area. Originally a private dwelling existed at this location, and in 1847 this was built over into a wood structure hotel known as the Depot House. Several years later a large hall and the main building was constructed. Five businesses were operating out of the Bethel Inn block when it burned to the ground on July 24, 1938. The Main Street Auto Exchange, Cronkhites Jewelry Store, the Clifford Pharmacy, The Atlantic and Pacific (A&P) grocery store, and the Bethel Inn and Restaurant occupied the two story all wood structure. Each of the five businesses had its own cellar hole separated from the others by walls of cut stone and concrete. The fire originated in the basement of the Jewelry store and quickly spread, engulfing the entire block in flames.

After the fire, the cellar holes were backfilled with fire debris and sand and gravel fill. The Socony gasoline service station to the southeast (Dean's Mobil site) suffered only minor fire damage.

During the 1940's, a Texaco gasoline service station was constructed at the former location of the Bethel Inn block. The gasoline tanks were placed underground probably within the confines of an old cellar hole. In 1960, Robert Dean purchased the Socony service station site and opened Dean's Mobil for business. At that time, two underground

Lincoln Applied Geology, Inc.
Environmental Consultants
RD # 1 Box 710 • Bristol, Vermont 05443 • (802) 453-4384 • FAX (802) 453-5399

gasoline tanks were located where the present gasoline tanks are situated. In 1964, Robert Dean purchased the adjoining Texaco station to the northwest. Although the Texaco station was out of business and the gasoline pumps were removed, the underground gasoline tanks remained in the ground until being excavated and removed in 1982. No new tanks were installed to replace those excavated.

After 1964, the former Texaco station building was renovated into Dean's Auto Parts, a retail auto parts store. The building was expanded in 1987, and Radio Shack operated a retail electronics store beside Dean's Auto Parts for two years until 1989, when Dean's Auto Parts expanded to occupy the entire building.

The date when the two underground gasoline tanks present at the Dean's Mobil site in 1960 were removed is unknown, but was probably around 1975. That year, three single-wall steel tanks were installed beneath the parking area to the northwest of the building. A single-wall steel diesel fuel tank was installed near the western corner of the building at about the same time. In 1989 the diesel fuel tank was excavated and removed, and a new double wall steel diesel tank was installed northwest of the three gasoline tanks near Dean's Auto Parts. At the same time, new double-wall fiberglass piping and overfill containment plumbing was installed on all three older gasoline tanks and the new diesel tank.

One 250 gallon underground waste oil tank is located near the eastern corner of the Dean's Mobil building. This tank receives waste oil from oil changes, etc. via two pipelines from the inside of the service bays. Safety Kleen pumps out and hauls the waste oil off site for proper disposal.

Scope of Investigation

A. Objectives

The objectives of Lincoln Applied Geology's (LAG) subsurface contaminant investigation were to:

1. Remove the source/sources of petroleum contamination,
2. define the degree, phase, and areal extent of petroleum contamination,
3. define ground water and contaminant flow direction and gradients,
4. design, install, and operate both subsurface soil vapor extraction and ground water remediation systems which would effectively contain and recover the petroleum contamination, and

Lincoln Applied Geology, Inc.
Environmental Consultants
RD # 1 Box 710 • Bristol, Vermont 05443 • (802) 453-4384 • FAX (802) 453-5399

5. minimize the potential for consumption of petroleum contaminated drinking water from Well #2 by the residents of the Bethel community.

B. Methodology Utilized to Accomplish Objectives:

The definition of the degree, phase, areal extent of subsurface contamination, flow direction, and gradients has involved:

1. the application of reconnaissance level field mapping techniques to define the surficial and bedrock geology of the site,

2. the installation of seven 2" diameter ground water quality monitoring wells: four wells on the site, two wells on CVRR property, and one well on Hills Fuel Co. property,

3. the descriptive logging and HNU photoionization detector (PID)/olfactory screening of all soils associated with ground water monitoring well installations,

4. the performance of a stadia type site survey and the generation of a scaled site map,

5. the collection of HNU PID and ground water level data,

6. the generation of ground water contour maps,

7. the collection and analysis of chemical ground water quality samples, and

8. the compilation, detailed review, and evaluation of all data collected to date.

The design, installation, and operation of contaminated ground water containment, recovery, and treatment system has involved:

1. detailed review of all data collected regarding ground water flow directions and gradients,

2. the installation of three 4" diameter soil vapor extraction wells,

3. the installation of 4" diameter ground water recovery wells,

4. the descriptive logging and HNU PID/olfactory screening of all soils associated with both the vapor extraction and recovery well

Lincoln Applied Geology, Inc.
Environmental Consultants
RD # 1 Box 710 • Bristol, Vermont 05443 • (802) 453-4384 • FAX (802) 453-5399

installations,

5. the installation of two Rotron blowers and the design and implementation of a soil vapor treatment system for vapors suctioned from each subsurface vapor well,

6. the installation of a QED Pulse Pump in each of the four recovery wells to depress the ground water and pump total fluids (ground water and petroleum) into an oil/water separator for the active separation and recovery of free product,

7. the design and implementation of a ground water treatment system consisting of two sets of two granular activated carbon canisters connected in series,

8. the active recovery of free product,

9. the weekly ground water level and HNU PID monitoring of all ground water monitoring wells, vapor extraction wells, and recovery wells,

10. the biweekly maintenance and water quality sampling of the ground water treatment system, and

11. the implementation of contaminant prevention measures to the Bethel drinking water system if evidence of gasoline contamination migration toward Well #2 and its APA is shown by ground water monitoring of MW-2 at the Hills Fuel Company.

Results of Investigation

On June 24, 1991, Steve Revell and Bill Norland of LAG visited the subject site with Richard Spiese of VDEC SMS to determine a proper course of action for the investigation of the extent of free, dissolved, and vapor phase gasoline contamination and the ultimate remediation of the problem. Field reconnaissance was conducted to locate potential environmental receptors in the area surrounding the site, and the Bethel municipal Well #2 was located on the west bank of the White River. Immediately downgradient of Dean's Mobil is the CVRR railroad tracks, downgradient of which is the Hills Fuel Co. with several above ground petroleum tanks. Permission was given to install a ground water monitoring well on Hills Fuel Co. property. A visit to the Bethel Town Hall and a meeting with Town Manager Delbert Cloud yielded maps of the Town's sewer system, water service line, storm sewer lines, and a commitment of full cooperation from the Town to aid with an expeditious solution to the petroleum contamination problem.

Lincoln Applied Geology, Inc.
Environmental Consultants
RD # 1 Box 710 • Bristol, Vermont 05443 • (802) 453-4384 • FAX (802) 453-5399

From June 25-28, 1991, LAG supervised the installation of seven 2" ground water quality monitoring wells by GMBC on the site and on two downgradient properties. Four wells were installed at the site (MW-1, MW-5, MW-6 and MW-7), two wells on CVRR property (MW-3 and MW-4), and one well on the Hills Fuel Co. property (MW-2). Detailed LAG soil logs are presented as Appendix A, and GMBC soil logs as Appendix B.

Unconsolidated surficial geologic deposits encountered at the site consisted of assorted fill materials of fine sand, silt, gravel, concrete, steel, and wood from beneath the asphalt pavement to a depth ranging from 10 to 12 feet which was underlain by coarse grained materials of fine to coarse gravel with some fine to coarse sand to a depth ranging from 18 to 20 feet. Below the gravels and sand are fine sand and silt deposits which extend to the top of weathered biotite gneiss bedrock at a depth ranging from 25 to 27 feet.

Both wells installed on CVRR property encountered assorted fill materials consisting of railroad ballast, gravel and sand, coal, and cinders from the surface to a depth of 6 feet that are underlain by coarser deposits of fine gravel with fine to medium sand to a depth of 15 feet. In MW-3, a layer of fine sand and silt was present above the weathered biotite gneiss bedrock from a depth of 15 to 22 feet. MW-4 encountered a compact, dense horizon of coarse gravel and cobble with silt and fine sand from 15 to 22 feet in depth. This is probably glacial till plastered onto the bedrock surface. This well yielded no ground water although the well point was below the ground water surface elevation in nearby MW-3.

MW-2, installed on Hills Fuel Co. property, did not encounter bedrock, but penetrated gravel, fine sand, and silt from the surface to a depth of 8 feet, then a thick sequence of fine sand and silt to a depth of 32 feet. A coarser layer containing fine sand with gravel was encountered from about 18 to 23 feet. **Figure 4** is a north to south schematic cross section from MW-6 to MW-2 detailing the surficial and bedrock geology, and buildings at the site, CVRR property, and Hills Fuel Co. property. **Figure 4** shows a coarse unit of gravel and sand extending from MW-6 to MW-2 that is overlain by fill materials and fine sand and gravel. It is underlain by fine sand and silt. The bedrock surface slopes toward the south and the valley of the Third Branch of the White River beneath the site and CVRR property. The ground water surface slopes steeply from the site toward The Third Branch of the White River and is present within the coarser gravel and sand deposits. Beneath the Hills Fuel Co. site the ground water surface dips into the fine sand and silt deposits. Depth to the bedrock surface here is unknown, but is at least 40 feet when based upon extrapolation of the bedrock surface from MW-3 to MW-2.

HNU PID levels and olfactory screening of soils encountered while drilling revealed that gasoline contamination of both soils and ground water has occurred on-site in the area surrounding and immediately downgradient of the leaking underground storage tank (LUST). MW-1, located downgradient of the LUST, had elevated vapor phase contamination levels of 100 to 120 parts per million (ppm) at a depth of 20 to 25.5 feet. A

Lincoln Applied Geology, Inc.
Environmental Consultants
RD # 1 Box 710 • Bristol, Vermont 05443 • (802) 453-4384 • FAX (802) 453-5399

faint gasoline odor was noted above the ground water surface at 15 to 17 feet, and stronger gasoline odors below the ground water surface at 20 to 22 feet.

MW-5, located beside the LUST, had PID levels of 140 to 240 ppm and strong gasoline odors both above and below ground water from a depth of 15 to 19 feet. MW-6, upgradient of the LUST along Main Street, had only background (BG) PID levels throughout the entire soil column. MW-7, downgradient of the diesel tank and beside Dean's Auto Parts, had only slight PID levels at 1.7 to 2.2 ppm above the ground water surface at a depth of 10 to 17 feet. On CVRR property PID levels in MW-3 were at background throughout the soil column, and only a slight level of 0.6 to 3.2 ppm was detected in MW-4 at a depth of 15 to 22 feet. At the Hills Fuel Co. property, a strong diesel fuel odor was noted in MW-2 from a depth of 10 to 22 feet, and elevated PID levels of 10.4 to 22 ppm were detected above the ground water surface at 10 to 17 feet. To the north of MW-2 are several large above ground fuel oil storage tanks. Free diesel fuel product was observed dripping steadily from the delivery piping on one of the tanks directly onto the unpaved ground surface. A large area of stained soil measuring approximately 6 feet by 6 feet was observed beneath the piping. It is evident that continual leakage of petroleum from defective piping contributes to soil contamination and poor ground water quality beneath the Hills Fuel Co. property.

A 2" diameter PVC ground water monitoring well was installed in each of the seven boreholes. At the site and at Hills Fuel Co., 20' lengths of 0.020" factory slotted well screen were installed and placed such that the top of the well screen was a minimum of eight feet above the ground water surface and the screen penetrated at least eight feet into the ground water. On CVRR property, shallowness to bedrock prevented placement of the well below 22 feet, so 10' lengths of well screen were installed and only MW-3 penetrated 3 feet into the ground water. MW-4 was dry when installed and has remained so to the present.

All ground water monitoring wells were installed with placement of a clean quartz sand pack in the annular space between the well and native soils to a height ranging from 1.0 to 3.5 feet above the top of the screen. A bentonite seal was then placed above the sand pack and the remainder of the borehole was backfilled with native soils to the surface. A 2" removable well plug was placed in the top of the well casing to prevent surface water contamination of the well. Flush-mounted cylindrical well boxes were then installed over each well and secured in place with concrete. Upon completion, each of the monitoring wells was properly developed using non-turbulent methods. All wells were then stadia surveyed to determine their relative location and top of casing (TOC) elevation, and nearby buildings, railroad tracks, and roads were surveyed and included on the Detailed Site Map presented as **Figure 3.**

LAG conducted a complete ground water monitoring survey of all seven wells on July 2, 1991. Ground water elevations, product thickness, and HNU PID levels were measured and the data results are presented as **Table 1** and **Table 2**, respectively.

Lincoln Applied Geology, Inc.
Environmental Consultants
RD # 1 Box 710 • Bristol, Vermont 05443 • (802) 453-4384 • FAX (802) 453-5399

Ground water quality samples were also collected from each well. Results of the monitoring survey indicate that free gasoline product was confined to two wells adjacent to and immediately downgradient of the LUST. Downgradient of the LUST, MW-1 had 0.04 feet of product, while adjacent to the LUST MW-5 had 0.39 feet of product. PID levels were elevated at 160 and 50 ppm in MW-1 and MW-5 respectively. MW-6 and MW-7 had BG vapor levels. MW-4 on CVRR property had an elevated PID reading of 82 ppm, and the well was dry. Its location downgradient of a malfunctioning oil/water separator behind Dean's Mobil building may explain the elevated vapor level. Oil and other fluids flow from the separator out onto the ground surface and down to the foot of the slope on CVRR property. Surface staining at the slope foot is only 10 to 15 feet from MW-4. Oil and other volatile fluids may be contributing to soil and ground water contamination in this area. MW-3, downgradient of the LUST on CVRR property, also had an elevated PID level at 36 ppm. This is probably caused by downgradient ground water migration of the dissolved gasoline phase. MW-2 on Hills Fuel Company property had a PID level of 14.0 ppm, reflecting the presence of diesel fuel oil or migrating gasoline in subsurface soils and ground water.

Ground water quality data results collected on July 2, 1991 are presented as **Table 3**. The data shows the greatest levels of total BTEX and MTBE contamination are in MW-1 and MW-5 at 47,800 and 35,840 parts per billion (ppb), respectively. MW-3 contains 411.4 ppb total BTEX and MTBE, providing further evidence that the dissolved gasoline phase has migrated downgradient beneath CVRR property from the LUST. No sample was obtained from MW-4 because it was dry. On the Hills Fuel Co. property MW-2 contains 59.6 ppb total BTEX and MTBE. This may be partially due to diesel fuel contamination noted during installation of MW-2, but the presence of MTBE suggests that a gasoline source has contributed to the ground water contamination.

A ground water contour map was developed from ground water elevation data collected on July 2, 1991 and is presented as **Figure 5**. MW-4 was a dry well. The data shows that ground water beneath the site flows south-southwest toward the slope to CVRR at the rear of the property. The ground water gradient on-site is 0.127 ft/ft and increases greatly to 0.286 ft/ft from the slope down to CVRR, and finally to 0.357 ft/ft between CVRR and the Hills Fuel Co. From the on-site slope to CVRR all the way to Hills Fuel Co. the ground water flow direction changes toward the west and the Third Branch of the White River. The presence of additional ground water monitoring wells in this area would aid with a more accurate determination of ground water flow direction.

We submitted a remediation proposal to Richard Spiese of the VDEC SMS on July 3, 1991. The proposal included the installation of three soil vapor extraction wells and four ground water recovery wells on-site in the area downgradient of and adjacent to the LUST, as well as a vapor treatment system and a total fluid pumping, recovery, treatment, and discharge system. The remediation proposal was approved by R. Spiese. We then contracted East Coast Drilling and Boring, Inc. (ECDB) of Derby, Vermont to install the

Lincoln Applied Geology, Inc.
Environmental Consultants
RD # 1 Box 710 • Bristol, Vermont 05443 • (802) 453-4384 • FAX (802) 453-5399

vapor extraction wells and ground water recovery wells. East Coast Drilling and Boring, Inc. soil logs are presented as **Appendix C.**

On July 8th free gasoline product was measured in MW-1 at 0.02 feet and in MW-5 at 0.49 feet. This represents a 50% decrease (0.02 feet) in MW-1 and a 25% increase (0.10 feet) in MW-5 since July 2nd. From July 8-10, 1991, three 4" diameter PVC vapor point wells (VP-1, VP-2, and VP-3) screened entirely above the ground water surface in the vadose zone were installed, and four 4" diameter PVC recovery wells (RW-1, RW-2, RW-3, and RW-4) screened from just above the ground water surface to approximately 10' below were installed.

HNU PID and olfactory screening of soils during installation of soil vapor extraction wells VP-1, VP-2, and VP-3 on-site revealed elevated vapor levels at a depth of 15 to 20 feet in all three wells. Vapor levels in VP-1 ranged from 56 to 122 ppm, levels in VP-2 ranged from 110 to 153 ppm, and levels in VP-3 ranged from 24 to 32 ppm. VP-1 is located downgradient and southwest of the LUST, VP-2 is also downgradient but closer to the LUST, and VP-3 is located between the building and pump islands about 20 feet southeast of the LUST. Strong gasoline odors were associated with soil samples from these depths in all three vapor wells.

Vapor wells were constructed of 4" diameter 0.020" factory slotted PVC screen with a flush coupled solid riser and installed entirely above the ground water surface in the vadose zone. Screened sections were 10 feet long and installed from 7 to 17 feet in VP-1 and VP-2, and 5 feet long from 11.5 to 16.5 feet in VP-3.

By July 9th vapor wells VP-1 and VP-2 were plumbed into the soil vapor extraction and treatment system and the system was started. One Rotron blower was used to suction vapors from the subsurface and force the vapors through two carbon canisters connected in series. The treated vapors were then discharged to the atmosphere through a vent exhaust stack above the roofline of the Dean's Mobil building. Initial PID readings showed elevated raw influent vapors leaving the Rotron blower prior to entering the vapor treatment system at 210 ppm, and effluent from the second carbon canister at BG levels.

During installation of the four ground water recovery wells, soils were screened using the HNU PID and olfactory senses. Elevated levels of gasoline vapors, from 33 to 178 ppm, were detected at a depth of 15 to 27 feet in RW-1 located downgradient of the LUST near the break in slope to CVRR. RW-3 and RW-4 also had elevated levels of 9.2 to 128 ppm and 88 to 126 ppm, respectively, at a depth of 15 to 22 feet. At a depth of 15 to 17 feet, RW-2 had a vapor level of 135 ppm. All wells had strong gasoline odors from the same depth horizons where elevated vapor levels were detected.

Recovery wells were constructed of 4" diameter, 0.020" factory slotted PVC screen and flush mounted soil riser pipe. RW-1, RW-2, and RW-3 were installed with 15 feet of

Lincoln Applied Geology, Inc.
Environmental Consultants
RD # 1 Box 710 • Bristol, Vermont 05443 • (802) 453-4384 • FAX (802) 453-5399

screen and about 15 feet of riser so that the ground water surface was about three feet below the top of the screen. RW-4 had 10 feet of screen and 13.5 feet of riser, with the ground water surface about five feet below the top of screen. On July 10th, a second Rotron blower and two additional air carbon canisters connected in series were added to the vapor extraction and treatment system. All three vapor wells (VP-1, VP-2, and VP-3) were plumbed such that both Rotron blowers were suctioning soil vapors from the wells, forcing them through a total of four carbon canisters (two sets connected in series), and venting the treated vapors through two vent exhausts positioned above the roofline of the Dean's Mobil building. The soil vapor extraction treatment system, and total fluid recovery and treatment system plumbing is shown in **Figure 6**.

Two pre-built wooden sheds were delivered to the site on July 15, 1991 and placed at the back of the parking area at the top of the slope to the CVRR property. The shed to house the electricity measures 6' x 10' and the treatment shed measures 8' x 16'. Both sheds are shown on **Figure 3**. The air compressor and two Rotron blowers were positioned inside the electric shed and electric service from an outside pole was wired to the inside breaker box. The air compressor supplies pressurized air to power the total fluid pumping system. Four air carbon canisters were placed inside the treatment shed, and the piping from the three soil vapor extraction wells was plumbed to the Rotron blowers and then into the air carbon canisters. Exhaust vent pipes were installed so that treated vapors could be exhausted from the carbon canisters outside to 15 feet above the ground and above the roofline of Dean's Mobil. The soil vapor extraction and treatment system was then turned on. It has operated properly since it was turned on.

A 1272 discharge permit application was completed by LAG and BOC, and sent to the Agency of Natural Resources (ANR), Department of Environmental Conservation (DEC), Permits, Compliance, and Protection Division for approval and authorization.

On July 16, 1991 0.41' of free gasoline product was measured in MW-5, having decreased from 0.49' on July 8th. Elevated PID levels were detected in VP-1 (140 ppm), VP-2 (150 ppm), and VP-3 (190 ppm). Free product was absent from MW-1. Ground water elevation data from July 16, 1991 was used to generate the ground water contour map presented as **Figure 7**. This map is similar to the ground water contour map developed for July 2, 1991 except that a shallow ground water trough is present in the area of MW-1 which extends toward the northeast. The overall ground water flow direction on-site is toward the south-southwest and the slope to CVRR. It then shifts toward the west between CVRR and the Hill Fuel Company property.

From July 16-18, 1991 the total fluid pumping, recovery, treatment, and discharge system was installed. This involved the placement of a QED Environmental Systems, Inc. (QED) Pulse Pump pneumatic well pump in each of the four recovery wells (RW-1, RW-2, RW-3, and RW-4).

Lincoln Applied Geology, Inc.
Environmental Consultants
RD # 1 Box 710 • Bristol, Vermont 05443 • (802) 453-4384 • FAX (802) 453-5399

The QED Pulse Pump operates on a gas displacement principle. Compressed air from the air compressor in the electric shed is supplied to a master control box in the treatment shed. The master control box controls the purge and fill cycles so that: 1) compressed air is delivered to each of the four Pulse Pumps in the recovery wells, filling the Pulse Pumps with air and forcing liquid to flow from the pump body to a surface discharge line, and 2) air in the Pulse Pump is then vented to allow the pump body to fill with liquid from the well. The length of time required for both the purge and fill cycles may be adjusted by controls within the master control box.

Within the treatment shed the total fluid recovery and treatment system consists of a 250 gallon covered oil/water separator, a covered sump pump drum, and four sealed water carbon canisters (two sets of two canisters connected in series). Liquids discharged from the four Pulse Pumps are forced to the surface by compressed air and into a 2" PVC discharge line, and then into the oil/water separator. Free gasoline product collects atop the water and is manually bailed into a covered product recovery drum. Contaminated water then flows by gravity out of the oil/water separator into the sump pump drum. When the water level in the tank reaches a predetermined maximum level, a float switch activates the sump pump and forces water out of the drum, through four granular activated carbon (GAC) treatment drums, through a flow meter, and out of the treatment building in a 2" PVC discharge line to the storm sewer on the west side of Main Street. This storm sewer flows southeast beneath Main Street to a surface discharge outfall pipe into the White River downstream of the Route 107 bridge. The plumbing for the soil vapor extraction treatment system and total fluid recovery treatment system is presented as **Figure 6**.

The sump pump drum is also equipped with a high water switch which automatically shuts off the compressed air supply to the QED master control box (and therefore the raw water supply) in the event of a malfunction that causes excess water to fill the sump pump drum.

On July 17th, LAG received the water quality data results from ground water samples collected on July 2, 1991. Data results are presented as **Table 3** and the Endyne Laboratory Report is presented as **Appendix D**. As mentioned before, data results reveal elevated levels of total BTEX and MTBE in MW-1 (47,800 ppb) and MW-5 (35,840 ppb). Lower levels are detected in MW-3 (411.4 ppb), MW-6 (77.7 ppb), and MW-2 (59.6 ppb). Only MW-7 is "clean", with none detected (ND).

The total liquid pumping, recovery, treatment, and discharge system is started on July 19th. It operated as designed, pumping total fluids and depressing the ground water surface until faulty seals on the air compressor caused a drastic loss of oil, destruction of the drive belts, overheating of the compressor, and finally a shut down of the system during the weekend.

Lincoln Applied Geology, Inc.
Environmental Consultants
RD #1 Box 710 • Bristol, Vermont 05443 • (802) 453-4384 • FAX (802) 453-5399

On July 22, 1991 the liquid system was discovered shut down with the air compressor in desperate need of repair. The sump pump drum was filled with untreated water and treatment system samples were scheduled to be collected on that day. By activating the sump pump, untreated water was forced through the carbon canisters and then treatment system samples were collected. The samples collected may not be representative of treated ground water since some of the water in the carbon canisters had remained stagnant for up to three days, but as little as several hours. The data results show that only MTBE is detected in the influent water at a concentration of 179 ppb. The effluent of can IA, can IB, and the total effluent are all none detected (ND) with no detectable BTEX or MTBE present. The Endyne Laboratory report is presented in **Appendix D**. A ground water monitoring round reveals elevated PID levels in VP-3 (200 ppm), VP-2 (152 ppm), and VP-1 (140 ppm). MW-2 at the Hills Fuel Company had an elevated vapor level of 72 ppm, and MW-4 had a level of 15.1 ppm. Vapor levels from other on-site wells are low to background (7.4 ppm to BG). Active ground water depression is observed in RW-2 and RW-3 suggesting that the fluid system shut down late in the weekend or early the morning of July 22, 1991. The seals on the air compressor and the drive belts were replaced, and the water system was placed back on-line and operating properly the next day.

HNU PID data collected on July 26th while the vapor extraction system was operating revealed elevated vapor levels in Rotron II out of 142 ppm and 150 ppm from both Between Can IA and the Effluent of Can IA as presented in **Table 2**. Breakthrough of the carbon canisters had occurred, so four new carbon canisters were installed and the vapor extraction system was put back in operation.

A complete PID and ground water elevation survey was conducted on July 29, 1991. Thickness of free gasoline product in MW-5 was 0.20 feet, a decrease of 0.15 feet since July 22nd. Elevated PID levels were detected in MW-5 (120 ppm), VP-3 (saturated lamp - SL), VP-2 (140 ppm), and VP-1 (130 ppm). Effluent from the vapor treatment system was 24 ppm from can IA, and 3.0 ppm from can IB. Because of the lack of data south of the recovery wells, three interpretations of the July 29, 1991 ground water data have been developed into contour maps presented as **Figure 8a**, **Figure 8b**, and **Figure 8c**. Active ground water depression is evident in RW-1 (4.45'), RW-2 (3.91'), RW-3 (7.36'), and RW-4 (1.43') when compared to ground water elevation data from July 26, 1991. The ground water flow direction on-site has been altered toward the south-southeast in the vicinity of RW-1, RW-2, and RW-3 in response to active ground water depression, and the ground water gradient has increased to 0.600 ft/ft between MW-5 and RW-3. The ground water flow direction between MW-7 and RW-4 has changed little, maintaining a dominant flow toward the south-southwest and then shifting toward the southwest between MW-3 and MW-2. Influence of the ground water pumping system is confined to the area adjacent to the recovery wells on-site. Although it cannot be confirmed due to the absence of ground water monitoring wells to the south, it appears that beneath the Dean's Mobil building a steep ground water trough has formed to the south of RW-1,

Lincoln Applied Geology, Inc.
Environmental Consultants
RD # 1 Box 710 • Bristol, Vermont 05443 • (802) 453-4384 • FAX (802) 453-5399

RW-2, and RW-3. Contaminated ground water flowing from the north and northwest of the recovery wells is captured and pumped by RW-1, RW-2, and RW-3.

Later in the day on the July 29th, the water system again shut down, caused by a faulty electric motor on the air compressor. On July 30th the sealed bearings and two capacitors in the motor were repaired in Burlington. An HNU PID monitoring round of the vapor extraction and treatment system showed elevated vapor levels continued to be extracted from VP-3 (240 ppm), VP-2 (162 ppm), and VP-1 (130 ppm). The effluent from can IA was 24 ppm. The repaired electric motor was installed on the air compressor on July 31st, and it was discovered that due to an electrical problem the electric breaker for the Rotron II blower was tripped, having been off for at least 24 hours. The carbon canisters for the soil vapor treatment system were then switched around, and elevated vapor levels were still being detected in VP-3 (230 ppm), VP-2 (164 ppm), and VP-1 (142 ppm), however the effluent from both can IA and can IB were at BG levels.

Concerns were now being voiced by Richard Spiese and others at VDEC regarding the quantity of and speed at which air carbon was being used to treat the soil vapors. The use of a catalytic furnace to incinerate the elevated levels of hydrocarbons in the soil vapors was considered to be more cost effective than carbon canisters. Phone calls were made and material was gathered on various catalytic furnaces to determine their feasibility for operation at the site. At the same time, plans were developed and materials ordered for placing the piping for both the soil vapor extraction and ground water pumping and discharge systems underground.

On August 6th vapor levels of the effluent from can IA (154 ppm) and can IB (135 ppm) were highly elevated, the carbon canisters providing no vapor treatment capability. The four air carbon canisters were replaced on August 7th with new carbon canisters, and a full ground water elevation, product thickness, and HNU PID monitoring survey was conducted. Once again, the total fluid pumping treatment and discharge system had shut down. In the air compressor the head gaskets and seals were destroyed and a heavy carbon buildup was found inside the cylinder heads and check valves. This was repaired by Air Compressor Engineering on August 8, 1991.

Data results from the monitoring round on August 7th showed that the thickness of free gasoline product in MW-5 had again decreased to 0.12 feet. Vapor levels remained elevated in VP-3 (170 ppm), VP-2 (120 ppm), and VP-1 (112 ppm), although a review of vapor levels since late July reveal a steady, continual decrease. The effluent from all four carbon canisters was at BG. Since the water system had shut down, ground water depression had not been maintained, resulting in ground water levels returning to normal.

On August 9th, Brian D. Kooiker, Chief of Permits, Protection, and Compliance at the ANR DEC, authorized the 1272 Discharge Permit Order (No. 7-9109). This allows the discharge of treated gasoline contaminated ground water from the Dean's Mobil site

Lincoln Applied Geology, Inc.
Environmental Consultants
RD # 1 Box 710 • Bristol, Vermont 05443 • (802) 453-4384 • FAX (802) 453-5399

remediation project to the White River via the Bethel Town municipal storm sewer. The maximum volume of treated ground water to be discharged to the storm sewer is limited to 28,800 gallons per day (gpd). In addition the activated carbon treatment system must be capable of treating the contaminated ground water such that the concentration of benzene is less than 5 ppb, the total benzene, toluene, ethylbenzene, and xylenes (BTEX) is less than 50 ppb, and the concentration of petroleum hydrocarbons is less than 1 ppm. The 1272 letter and order are presented as **Appendix E**.

Ground water treatment system samples were collected on August 9th and the data results presented as **Appendix D**. This data revealed that low concentrations of benzene (3.51 ppb), xylenes (55.4 ppb), and MTBE (156 ppb) were detected in the influent water. The effluent of can IA, can IB, and the total effluent had none detected (ND) levels. HNU PID data was also collected and revealed elevated vapor levels and that breakthrough was occurring for the first canister in series in vapor can IA (60 ppm) and vapor can IB (70 ppm). Breakthrough was just beginning in the effluent for can IA (0.4 ppm) and absent for can IB (BG).

Another complete ground water monitoring round was performed on August 13, 1991. For the first time since the soil vapor extraction and treatment system had been put on-line, an increase in gasoline product thickness had occurred in MW-5 (0.15 feet). HNU PID levels in VP-3 (170 ppm) and VP-2 (120 ppm) remained the same as on August 9th, however VP-1 (82 ppm) had decreased slightly from 112 ppm. Meanwhile, effluent levels from can IA (62 ppm) and can IB (70 ppm) had increased significantly. The ground water elevation data was used to generate the ground water contour map presented as **Figure 9**. Although the total fluid pumping and treatment system had been operating successfully since August 8th, the magnitude of ground water depression was far less than that observed on July 29th. The reason for this became readily apparent on August 20th when it was discovered that the air supply lines from the air compressor, air lines inside the QED master control box, and valves inside the well head controllers were coated with thick oil from the previously damaged head gaskets and wheel bearings of the air compressor. This oil caused greatly reduced efficiency of the four Pulse Pumps and air delivery system, thus affecting the magnitude of ground water depression. Nonetheless, the ground water contour map for August 13th shows a ground water gradient of 0.375 ft/ft between MW-5 and RW-3, and a flow direction toward the south-southeast and a probable ground water trough beneath the Dean's Mobil building. As seen in **Figure 8** (July 29th, 1991) the ground water flow direction between MW-7 and RW-4 has remained about the same, with a dominant flow toward the south-southwest and then shifting toward the southwest between MW-3 and MW-2.

From August 14 to 20, 1991 the piping for the vapor and fluid systems was placed underground. Surface plumbing for both the soil vapor extraction and treatment system, and the total fluid pumping, recovery, treatment, and discharge system were disassembled, and operation of the systems temporarily halted on August 14, 1991. An excavator was used to dig trenches three feet wide and three feet deep along the

Lincoln Applied Geology, Inc.
Environmental Consultants
RD # 1 Box 710 • Bristol, Vermont 05443 • (802) 453-4384 • FAX (802) 453-5399

alignment from all three vapor wells and the four recovery wells to the electric and treatment sheds, and then out to the storm sewer on the west side of Main Street. The purpose of this action was to place wellheads and system piping underground and insulate it for the upcoming winter months, as well as return the full use of the parking area and service station property to Dean's Mobil.

During excavation in front of the building, the excavator snagged an electrical pipe supplying electricity to the fuel pumps on the pump island. All wires inside the pipe were severed and power to one pump was shut down. A computer panel (installed with no surge protection devices) servicing the pump island was destroyed by the electrical surge. Two other pipes located beneath the severed pipe were in poor condition, with the pipe junctions completely corroded. One pipe was empty, the other contained electrical wires. The severed electric wires were temporarily spliced together and power restored to the pumps, and the two lower pipes were splinted for support. This trench was left open until FEDCO could rewire the entire electrical conduit from the building to the pump island. The rewiring was completed on August 28, 1991. It was also noted that the main electrical panel servicing the Dean's Mobil building was drawing a much larger electrical current than it was designed to accommodate, and as a result is very hot and presents a dangerous safety hazard which could lead to a fire.

Placement of the PVC pipes for both vapor and fluid systems required plumbing an 'active' 4" diameter PVC vapor extraction line and an active 2" diameter PVC fluid discharge line from the vapor wells and recovery wells, respectively, to the treatment shed. A spare 4" diameter PVC line and 2" diameter PVC fluid discharge line were also plumbed beside the active line as an emergency backup in the event of active line failure. Both 1/4 " and 1/2" plastic air pressure lines supplying compressed air to the Pulse Pumps in the recovery wells were extended alongside the active lines. The two active lines and two air pressure lines were wrapped their entire length with Frostex heat tape. The two spare lines were also wrapped their entire length with a separate Frostex heat tape. Both the active and spare lines were then inserted into 15" diameter ADS corrugated plastic pipe conduit. Junctions of the pipe were sealed with duct tape, ADS couplings, or cut sections of ADS pipe or couplings.

A total of nine manway boxes constructed of pressure treated lumber were placed over one monitoring well (MW-5), each vapor well (VP-1, VP-2, and VP-3), each recovery well (RW-1, RW-2, RW-3, and RW-4), and over the piping between the treatment and electric sheds. The wood boxes are outfitted with a level manway constructed of galvanized steel and a steel diamond plate cover. The manways provide access to the wells and its associated piping.

Active and spare 2" diameter PVC pipe discharge lines from the treatment shed to the storm sewer were placed in a trench and wrapped together in another separate coil of Frostex heat tape. Access to the storm sewer was gained by drilling through a brick

Lincoln Applied Geology, Inc.
Environmental Consultants
RD # 1 Box 710 • Bristol, Vermont 05443 • (802) 453-4384 • FAX (802) 453-5399

wall, extending the pipe through the hole, and then sealing the space between the pipe and brick with silicone sealant.

Pipes in the trenches were backfilled to the upper surface with excavated material. Two foot wide panels of 1.5" thick Homasote insulation board was placed atop the pipes, and then the entire trench was backfilled to grade with excavated material which was properly compacted. Asphalt paving of all the trenches was completed on August 30, 1991.

On August 16th, the vapor extraction and treatment system was put back into operation, and then was shut off on August 19th while additional plumbing continued. It was turned permanently on August 20th. An attempt to resume operation of the total fluid pumping, recovery, and discharge system was made on August 21st, but due to oil clogging of the air lines in the QED master control box and the valves in the well head operators, the system was shut down. The following day the QED master control box and well head operators were removed from the treatment shed and sent to QED for complete servicing. As a result of the oil carry over and clogging problem, QED recommended that a particulate filter and air dryer be installed between the compressor and the QED master control box. These were both installed on August 30th along with the completely serviced master control box. The total fluids pumping system was returned to continuous operation on August 30.

At present the vapor extraction and treatment systems are functioning properly, and vapor carbon canisters are being changed when breakthrough is detected. Now that all the operational deficiencies have been worked out, the total fluid pumping, recovery, treatment, and discharge system is operating continuously and properly. Because of its intermittent operation up to the 30th, only 10,500 gallons of treated water has been discharged to the storm sewer since the system was first turned on July 19, 1991.

CONCLUSIONS

In light of all data collected to date at the Dean's Mobil site in Bethel, Vermont, the following conclusions are presented.

1. At least 1,400 gallons of special unleaded gasoline was released catastrophically from one 4,000 gallon underground petroleum storage tank at Dean's Mobil between June 19 and 21, 1991.

2. Free phase gasoline exists on the ground water surface beneath the site in the vicinity of MW-5 at thicknesses of up to 0.49 feet. However, the product thickness has been steadily decreasing since the remedial systems were activated.

Lincoln Applied Geology, Inc.
Environmental Consultants
RD # 1 Box 710 • Bristol, Vermont 05443 • (802) 453-4384 • FAX (802) 453-5399

3. The subject underground petroleum storage tank remains in place and in an empty condition.

4. The Third Branch of the White River lies 750 feet west of the site, and the confluence of the Third Branch of the White River and the White River lies 750 feet south of the site. These rivers represent the ultimate discharge zones of the ground water system beneath the site.

5. The primary production well (Well #2) for the Town of Bethel water system is located 1,500 feet south-southwest of and hydraulically downgradient of the contaminant source area. However, the well is located across the Third Branch of the White River from the source area.

6. The drinking water supply's source is an unconfined to semi-confined unconsolidated aquifer hydraulically connected to the unconsolidated aquifer in which the subject gasoline release occurred. However, it is highly unlikely that ground water contamination from the site will impact Well #2 because the Third Branch of the White River, the ultimate ground water discharge zone, lies between the site and Well #2.

7. The soils encountered beneath the site consist of a layer of assorted fill materials above well drained gravel and sand deposits which in turn are underlain by fine sand and silt. Biotite gneiss bedrock was encountered in some borings at a depth of 25 to 30 feet.

8. An additional potential source of petroleum contamination affecting soils and ground water between Dean's Mobil and the water supply well was identified. Petroleum type contamination was found in MW-2 on Hills Fuel Company property which is located southwest of the Dean's Mobil site. Fuel oil was observed actively leaking from valves associated with Hills' above grade fuel storage facility.

9. The oil/water separator behind Dean's Mobil has also been identified as an additional source of petroleum contamination in the soils near MW-4 on CVRR property.

10. Ground water flows from the contaminant source area southwest towards the CVRR property and then south-southwest towards the Hills Fuel Company property and the Third Branch of the White River. The lack of ground water elevation data between MW-3 and MW-2 prevents an accurate determination of ground water flow characteristics in this area.

Lincoln Applied Geology, Inc.
Environmental Consultants
RD # 1 Box 710 • Bristol, Vermont 05443 • (802) 453-4384 • FAX (802) 453-5399

11. Quantifiable amounts of dissolved gasoline associated contamination are present in ground water monitoring wells installed on-site, on the CVRR property, and on the Hills Fuel Company property.

12. Installation and operation of a soil vapor extraction and treatment system has resulted in a continuous decrease of soil vapor levels in the subsurface, the decrease of free product in MW-5, and the elimination of free product in MW-1.

13. A catalytic furnace for incinerating the elevated soil vapors is considered more cost effective than operating the GAC canisters. A catalytic unit now available from the State of Vermont is scheduled to be installed on-site during the first week of September.

14. Installation and operation of a total fluid pumping, recovery, treatment, and discharge system has resulted in the intermittent modification of ground water and contaminant flow beneath the site. The intermittent versus continuous impacts are related to on-going mechanical problems associated with the air compressor and QED Pulse Pump system.

15. When the four recovery wells are operating properly, a linear ground water interception zone (i.e. trough) forms resulting in a diversion of contaminated ground water from the south-southwest to the south-southeast where it is collected by the total fluids recovery system.

16. Total fluids pumped into the oil/water separator have contained only a sheen of gasoline, and very low levels of dissolved contaminants as evidenced by the treatment system samples collected and analyzed to date. Low levels of ground water contaminants are also present in MW-2 and MW-3 located downgradient off-site, and MW-6 upgradient on-site. Ground water contamination in these wells may have resulted from earlier petroleum spills and overfills at the site prior to the catastrophic gasoline leak. Elevated levels of dissolved ground water contaminants in MW-1 and MW-5 located immediately downgradient and adjacent to the LUST, respectively, is a direct result of their close proximity to the LUST and the presence of free product in these wells. The majority of free gasoline product released from the LUST was probably adsorbed by the silt, sand, and gravel soil particles, and remained as residual product in the thick unsaturated zone beneath the LUST until installation and operation of the soil vapor extraction and treatment system. Dissolved and freephase product impacts to the ground water immediately surrounding the LUST have been minimized by soil adsorption and operation of the soil vapor extraction and treatment system.

Lincoln Applied Geology, Inc.
Environmental Consultants
RD # 1 Box 710 • Bristol, Vermont 05443 • (802) 453-4384 • FAX (802) 453-5399

17. Continuous ground water depression resulting in an increase in the amount of contaminated ground water recovered and treated has resumed now that the mechanical problems associated with the air compressor and QED Pulse Pump system have been corrected.

RECOMMENDATIONS

Based on the findings to date and the presented conclusions, the following recommendations are set forth for review.

1. Continue the current level of ground water elevation, HNU PID, and chemical ground water quality data collection.

2. Continue operation and maintenance of the current soil vapor extraction and granular activated carbon treatment system until a suitable catalytic furnace can be installed on-site to incinerate the elevated levels of contaminant vapors.

3. Continue the full time operation and maintenance of the total fluid pumping, recovery, treatment, and discharge system associated with RW-1, RW-2, RW-3, and RW-4.

4. Repair the oil/water separator behind Dean's Mobil building and establish a maintenance program that includes pumping of product from the separator chamber on a regular schedule.

5. Install a minimum of three additional ground water monitoring wells as presented in **Figure 10**. One well would be installed southeast of Dean's Mobil building downgradient of the underground waste oil tank. Two other wells would be installed on the Hills Fuel Company property, one about 80 feet northwest of MW-2 and the other about 60 feet west-southwest of MW-2. The placement of the proposed wells would aid in the development of a more accurate ground water flow map for the area southwest of the Dean's Mobil building and the area between the site and the CVRR, the Hills Fuel Company property, and the river. The proposed wells would also aid in better defining the dissolved contaminant plume and determining the over-all effectiveness of the remediation.

Lincoln Applied Geology, Inc.
Environmental Consultants
RD # 1 Box 710 • Bristol, Vermont 05443 • (802) 453-4384 • FAX (802) 453-5399

Table 1

Project: Dean's Mobil Job # 9070

Location: Bethel, Vermont Sheet # 1 of 2

Ground Water Elevation/Product Thickness Data (feet)

Data Point	TOC [2]	7-2-91	7-8-91	7-16-91	7-22-91	7-29-91	8-7-91	8-9-91
MW-1	99.95	0.04 80.45	0.02 80.41	81.51	81.25	81.35	81.35	81.55
MW-2	54.48	36.94	36.83	36.80	36.69	36.58	36.55	36.48
MW-3	83.58	66.68	66.51	67.56	67.18	66.23	66.02	67.68
MW-4	83.50	Dry @ 63.15	Dry @ 63.22	Dry @ 63.20	Dry @ 63.22	Dry @ 63.00	Dry @ 63.22	Dry @ 63.20
MW-5	100.63	0.39 83.98	0.49 84.00	0.41 83.65	0.35 83.53	0.20 83.48	0.12 83.33	0.10 83.48
MW-6	100.00 [1]	88.75	88.88	88.00	88.42	87.25	86.62	82.85
MW-7	100.05	84.84	84.47	83.01	83.97	82.63	82.48	82.50
RW-1	100.11			83.26	83.08	78.81	82.37	82.71
RW-2	101.21			83.44	79.53	79.11	82.86	83.01
RW-3	101.37			83.75	76.99	76.39	82.77	83.07
RW-4	100.82			83.15	81.94	81.72	82.67	82.82

Notes:

1) Elevation Datum Assumed

2) Reference Elevation is elevation of top of PVC well casing

Table 1

Project: Dean's Mobil Job # 9070

Location: Bethel, Vermont Sheet # 2 of 2

Ground Water Elevation/Product Thickness Data (feet)

Data Point	TOC	8-13-91						
MW-1	99.95	81.40						
MW-2	54.48	36.68						
MW-3	83.58	68.53						
MW-4	83.50	Dry @ 63.20						
MW-5	100.63	0.15 83.43						
MW-6	100.00	86.40						
MW-7	100.05	82.60						
RW-1	100.11	82.41						
RW-2	101.21	81.81						
RW-3	101.37	79.41						
RW-4	100.82	82.40						

Notes:

1) Elevation Datum Assumed

2) Reference Elevation is elevation of top of PVC well casing

Table 2

Project: Dean's Mobil Job # 9070

Location: Bethel, Vermont Sheet # 1 of 2

HNU Photoionization Readings (PID) (ppm)

Data Point	7-2-91	7-8-91	7-9-91	7-16-91 *	7-17-91	7-18-91	7-22-91	7-26-91 *
MW-1	160	15.8		BG			7.4	
MW-2	14.0	2.2		2.6			72	
MW-3	36	28		BG			1.6	
MW-4	82	9.0		0.4			15.1	
MW-5	50	1.4		BG			BG	
MW-6	0.4	BG		BG			0.4	
MW-7	3.2	BG		BG			2.8	
RW-1				0.2			0.6	
RW-2				BG			BG	
RW-3				BG			BG	
RW-4				BG			BG	
VP-1				140			140	56
VP-2				150			152	18.2
VP-3				190			200	12.2
Electric Shed				15.0	12.2	23		
Treatment Shed				10.6	12.6	24		
Raw Air In							108	12.0
Rotron I Out			210				60	9.2
Rotron II Out							56	142
Between Can IA								150
Between Can IB								30
Effluent Can IA								150
Effluent Can IB			BG					12.0

Notes: BG - Background

SL - Saturated Lamp

* - While Vapor Extraction System is in Operation.

Table 2

Project: Dean's Mobil Job # 9070

Location: Bethel, Vermont Sheet # 2 of 2

HNU Photoionization Readings (PID) (ppm)

Data Point	7-29-91	7-30-91	7-31-91	8-6-91	8-7-91	8-9-91	8-13-91	
MW-1	0.2				BG	BG	BG	
MW-2	1.2				1.6	0.8	1.0	
MW-3	0.2				BG	BG	BG	
MW-4	BG				BG	BG	BG	
MW-5	120				12.8	BG	BG	
MW-6	BG				0.6	BG	BG	
MW-7	BG				BG	BG	BG	
RW-1	1.4	1.4	BG		0.6	BG	3.0	
RW-2	2.0	0.6	0.3		BG	BG	BG	
RW-3	2.0	1.2	0.6		0.2	BG	BG	
RW-4	1.0	BG	BG		0.4	BG	0.2	
VP-1	130	156	142		112		82	
VP-2	140	162	164		120		120	
VP-3	SL	240	230		170		170	
Electric Shed	12.0	9.8	26		BG		0.8	
Treatment Shed	15.0	34	12.6		BG		9.0	
Raw Air In	110	176	122		100	100	92	
Rotron I Out	140	104	168	150	120	120	100	
Rotron II Out	130	176	96 [1]	130	122	120	110	
Between Can IA	100	154	56 [1]		BG	60	90	
Between Can IB	2.0	0.7	83		BG	70	110	
Effluent Can IA	24	24	BG [1]	154	BG	0.4	62	
Effluent Can IB	3.0	0.5	BG	135	BG	BG	70	

Notes: BG - Background

SL - Saturated Lamp

1 - Air system not operating for 24 hours.

Dean's Mobil

Table 3

Chemical Water Quality Results (ppb)

Well #	7-2-91 [1]					
MW-1	2,800 / 47,800					
MW-2	20.2 / 59.6					
MW-3	69.8 / 411.4					
MW-4	— / —					
MW-5	2,990 / 35,840					
MW-6	19.4 / 77.7					
MW-7	ND / ND					

Notes:

MTBE / Total BTEX/MTBE

— No Sample Taken

FP - Free Product

ND - None Detected

TBQ - Trace Below Quantifiable Limits

1 - Analyzed by Endyne

APPENDIX A

Detailed Lincoln Applied Geology, Inc.

Soil Logs

Dean's Mobil

Well: MW-1

Location: Dean's Mobil Parking Area

Driller: Green Mountain Boring Company, Inc.

Hydrogeologist: Bill Norland, Lincoln Applied Geology, Inc.

Date: June 25, 1991

Soils Description:

Depth	Description	HNU (ppm)
0.0 - 0.3'	Asphalt	
5.0 - 7.0'	Tan, dry, fine sand; little silt; trace of pebbles	Back-ground (BG)
10.0 - 12.0'	Tan, dry, silt and fine sand; trace of concrete. Detergent odor.	BG
15.0 - 17.0'	Gray, dry, gravel and pebbles; some medium to coarse sand; trace of fine sand and silt. Faint gasoline odor.	8.4
20.0 - 20.75'	Gray brown, wet, medium to coarse sand and gravel; trace of fine sand.	110
20.75 - 22.0'	Gray brown, wet, silt and fine sand; gasoline and detergent odors	
25.0 - 25.5'	Gray brown, wet fine sand; little silt	120
25.5 - 26.5'	Gray brown, wet, weathered biotite gneiss	2.0
30.0 - 30.5'	Gray brown, wet, fine sand and silt; some weathered biotite gneiss	1.4

Well Construction

Bottom of Boring: Bedrock refusal at 30.5'
Well Screen: (20') 8.5' - 28.5' - 0.020" slot, 2" PVC sch 40
Solid Riser: (8.5') 0' - 8.5' - 2" PVC sch 40
Sand Pack: (24') 6.5 - 30.5'
Bentonite Seal: (1.5') 5'- 6.5'
Backfill: (5') 0' - 5'
Well Box: One - flush with ground surface

Dean's Mobil

Well: MW-2

Location: Hills Fuel Company Parking Area

Driller: Green Mountain Boring Company, Inc.

Hydrogeologist: Bill Norland, Lincoln Applied Geology, Inc.

Date: June 25 - 26, 1991

Soils Description:

Depth	Description	HNU (ppm)
0.0'	Sand and gravel surface	
5.0 - 7.0'	Brown, dry, gravel; some fine sand and silt; trace of medium to coarse sand. Detergent odor	1.1
10.0 - 12.0'	Dark gray, dry, fine sand; some silt; trace of fine gravel and wood fragments. Diesel fuel odor	22
15.0 - 17.0'	Dark gray, dry, fine sand; some silt; trace of fine gravel and wood fragments. Diesel fuel odor	10.4
20.0 - 22.0'	Black, wet, fine sand; some gravel; little silt. Diesel fuel odor	1.6
25.0 - 27.0'	Tan brown, wet, fine sand; little silt.	1.3
30.0 - 31.0'	Tan brown, wet, fine sand; little silt; trace of fine gravel	13.2
31.0 - 32.0'	Tan brown, wet, fine sand; some silt; little medium to coarse sand and fine gravel	0.8

Well Construction

Bottom of Boring: 32'
Well Screen: (20') 10' - 30' - 0.20" slot 2" PVC, sch 40
Solid Riser: (10') 0' - 10' - 2" PVC, sch 40
Sand Pack: (22') 8' - 30'
Bentonite Seal: (2') 6' - 8'
Backfill: (6') 0' - 6'
Well Box: One - flush with ground surface

Dean's Mobil

Well: MW-3

Location: CVRR - between spur tracks

Driller: Green Mountain Boring Company, Inc.

Hydrogeologist: Bill Norland, Lincoln Applied Geology, Inc.

Date: June 26, 1991

Soils Description:

Depth	Description	HNU (ppm)
0.0'	Railroad ballast Gravel and Sand	
5.0 - 6.0'	Dark gray, dry, silt, coal, cinders, gravel	BG
6.0 - 7.0'	Brown, dry, medium sand; little coarse sand	BG
10.0 - 12.0'	Gray brown, dry, fine gravel; little fine to medium sand; trace of medium gravel. Detergent odor.	BG
15.0 - 17.0'	Tan and buff, dry, weathered biotite gneiss; little fine sand and silt	BG
20.0 - 22.0'	Brown, wet, fine sand; some silt; trace of coarse gravel biotite gneiss	BG
22.5'	Bedrock refusal - rods bouncing	

Well Construction

Bottom of Boring: Bedrock refusal at 22.6'

Well Screen: (10') 12' - 22' - 0.020" slot, 2" PVC sch 40

Solid Riser: (12') 0' - 12' - 2" PVC sch 40

Sand Pack: (12') 10' - 22'

Bentonite Seal: (2') 8' - 10" and (0.5') 22' - 22.5'

Backfill: (8') 0' - 8'

Well Box: One, flush with ground surface

Dean's Mobil

Well: MW-4

Location: CVRR - between spur tracks

Driller: Green Mountain Boring Company, Inc.

Hydrogeologist: Bill Norland, Lincoln Applied Geology, Inc.

Date: June 26, 1991

Soils Description:

Depth	Description	HNU (ppm)
0.0'	Railroad ballast sand, gravel, cinders, coal	
5.0 - 5.75'	Black, dry, coal and gravel; little cinders	BG
5.75 - 7.0'	Gray brown, dry, fine gravel; little to medium sand; trace of medium gravel. Detergent odor.	
10.0 - 12.0'	Gray brown, dry, fine gravel; little fine to medium sand; trace of medium gravel.	BG
15.0 - 17.0'	Brown, tan, gray, dry, coarse gravel and cobbles; some fine sand and silt; trace of fine gravel	3.2
20.0 - 22.0'	Olive green, brown, buff, moist, coarse gravel and cobbles; some silt and fine sand (biotite gneiss fragments) possibly glacial till	0.6

Well Construction

Bottom of Boring: 22'

Well Screen: (10') 11' - 21' - 0.020" slot 2" PVC sch 40

Solid Riser: (11') 0' - 11' - 2" PVC sch 40

Sand Pack: (12.5') 9' - 21.5'

Bentonite Seal: (2') 7' - 9' and (0.5') 21.5' - 22'

Backfill: (7') 0' - 7'

Well Box: One, flush with ground surface

Dean's Mobil

Well: MW-5

Location: Dean's Mobil, beside LUST

Driller: Green Mountain Boring Company, Inc.

Hydrogeologist: Bill Norland, Lincoln Applied Geology, Inc.

Date: June 27, 1991

Soils Description:

Depth	Description	HNU (ppm)
0.0 - 0.3'	Asphalt	
5.0 - 7.0'	Brown, tan, dry, fine sand; some gravel; trace of asphalt	BG
10.0 - 10.6'	Brown, dry, fine sand and gravel	5.4
10.6 - 12.0'	Gray tan, dry, fine to medium gravel; some fine to coarse sand	19.8
15.0 - 17.0'	Gray tan, dry, fine to medium gravel; some coarse sand. Detergent odor	140
17.0 - 17.7'	Brown, dry, fine gravel; some fine to coarse sand. Gasoline odor	240
17.7 - 19.0'	Brown, wet, fine sand; little silt. Gasoline odor	160
20.0 - 22.0'	Brown, wet, fine sand; little silt	7.0
25.0 - 25.25'	Brown, wet, fine sand; some fine gravel; little silt	7.5
25.25 - 25.5'	White and black, wet, weathered biotite gneiss	

Well Construction

Bottom of Boring: Bedrock refusal at 25.5'
Well Screen: (20') 5' - 25' - 0.020" slot 2" PVC sch 40
Solid Riser: (5') 0' - 5' - 2" PVC sch 40
Sand Pack: (22') 3' - 25'
Bentonite Seal: (2') 1' - 3' and (0.5') 25' - 25.5'
Backfill: (1') 0' - 1'
Well Box: One, flush with ground surface

Dean's Mobil

Well: MW-6

Location: Dean's Mobil, near Main Street

Driller: Green Mountain Boring Company, Inc.

Hydrogeologist: Bill Norland, Lincoln Applied Geology, Inc.

Date: June 27, 1991

Soils Description:

Depth	Description	HNU (ppm)
0.0 - 0.3'	Asphalt	
5.0 - 5.5'	Gray, moist, gravel; some fine to medium sand	BG
5.5 - 7.0'	Olive green, moist, silt; some thinly laminated very fine sand	
10.0 - 12.0'	Gray tan, dry, fine to medium gravel; some fine to coarse sand. Detergent odor	BG
15.0 - 15.7'	Brown, wet, fine to coarse gravel; some fine to coarse sand	BG
15.7 - 17.0'	Brown, wet, fine sand; little silt	
20.0 - 22.0'	Brown, wet, fine sand; some silt and angular coarse gravel biotite gneiss fragments; trace of clay	BG
25.0 - 26.25'	Brown, buff, green, wet, fine sand; some coarse gravel biotite gneiss fragments and silt	BG

Well Construction

Bottom of Boring: Bedrock refusal at 26.25'
Well Screen: (20') 5' - 25' - 0.020" slot 2" PVC sch 40
Solid Riser: (5') 0' - 5' - 2" PVC sch 40
Sand Pack: (22') 3' - 25'
Bentonite Seal: (1') 2' - 3' and (0.5') 25' - 25.5'
Backfill: (2') 0' - 2'
Well Box: One, flush with ground surface

Dean's Mobil

Well: MW-7

Location: Dean's Mobil Parking Area

Driller: Green Mountain Boring Company, Inc.

Hydrogeologist: Bill Norland, Lincoln Applied Geology, Inc.

Date: June 28, 1991

Soils Description:

Depth	Description	HNU (ppm)
0.0 - 0.3'	Asphalt	
5.0 - 7.0'	Tan, dry, fine sand; little silt; trace of fine gravel	BG
10.0 - 12.0'	Gray tan, brown, dry, fine to coarse gravel; some medium to coarse sand. Detergent odor	1.7
15.0 - 16.3'	Gray tan, moist, fine to coarse gravel; some medium to coarse sand. Detergent odor	2.2
16.3 - 17.0'	Brown, moist, very fine sand and silt. Detergent odor	
17.0 - 19.0'	Brown, wet, very fine sand and silt	0.6
20.0 - 21.3'	Brown, wet, very fine sand and silt	BG
21.3 - 22.0'	Olive green, wet, weathered biotite gneiss; some fine sand and silt	BG
22.0 - 24.0'	Brown, olive green, wet, weathered biotite gneiss; some fine sand and silt	BG

Well Construction

Bottom of Boring: 27'
Well Screen: (20') 5' - 25' - 0.020" slot 2" PVC sch 40
Solid Riser: (5') 0' - 5' - 2" PVC sch 40
Sand Pack: (22') 3' - 25'
Bentonite Seal: (2') 1' - 3'
Backfill: (1') 0' - 1'
Well Box: One, flush with ground surface

Dean's Mobil

Well: VP-1

Location: Dean's Mobil Parking Area

Driller: East Coast Drilling and Boring, Inc.

Hydrogeologist: Bill Norland, Lincoln Applied Geology, Inc.

Date: July 8, 1991

Soils Description:

Depth	Description	HNU (ppm)
0.0 - 0.3'	Asphalt	
10.0 - 11.6'	Tan, dry, fine sand; little silt and fine gravel	BG
11.6 - 12.0'	Dark brown, dry, silt; some fine sand; trace of gravel. Detergent odor	
15.0 - 17.0'	Green, buff, tan, dry, fine to coarse gravel; some fine to coarse sand. Gasoline odor	56
18.0 - 19.2'	Tan, dark brown, wet, fine to coarse gravel; some fine to coarse sand. Gasoline product on soil	122
19.2 - 20.0'	Tan, dark brown, wet, silt; some fine sand; trace of gravel. Gasoline product on soil.	
	Water in augers at 17.5' Set bottom of well screen at 17.0'	

Vapor Well Construction:

Bottom of Boring: 20'
Well Screen: (10') 7' - 17' - 0.020" slot 4" PVC sch 40
Solid Riser: (9') +2' - 7' - 4" PVC sch 40
Sand Pack: (11.75') 6.25' - 18'
Bentonite Seal: (2.5') 3.75' - 6.25'
Backfill: (3.75') 0' - 3.75'
Well Box: None

Dean's Mobil

Well: VP-2

Location: Dean's Mobil, near LUST

Driller: East Coast Drilling and Boring, Inc.

Hydrogeologist: Bill Norland, Lincoln Applied Geology, Inc.

Date: July 8, 1991

Soils Description:

Depth	Description	HNU (ppm)
0.0 - 0.3'	Asphalt	
10.0 - 10.4'	Dark brown, dry, fine to medium sand; some gravel; little silt; trace of wood fragments	3.0
10.4 - 12.0'	Green, tan, buff, dry, gravel; some fine to coarse sand. Detergent odor	
15.0 - 17.0'	Green, tan, buff, dry, gravel; some fine to coarse sand. Gasoline odor	153
18.0 - 20.0'	Brown, wet, fine sand and silt; trace of medium sand. Gasoline odor	110
	Water in augers at 17.5' Set bottom of well screen at 17.0'	

Vapor Well Construction:

Bottom of Boring: 20'
Well Screen: (10') 7' - 17' - 0.020" slot 4" PVC sch 40
Solid Riser: (9') +2' - 7' - 4" PVC sch 40
Sand Pack: (12.5') 5.5' - 18'
Bentonite Seal: (5') 0.5' - 5.5'
Backfill: (0.5') 0' - 0.5'
Well Box: None

Dean's Mobil

Well: VP-3

Location: Dean's Mobil, in front of building

Driller: East Coast Drilling and Boring, Inc.

Hydrogeologist: Bill Norland, Lincoln Applied Geology, Inc.

Date: July 10, 1991

Soils Description:

Depth	Description	HNU (ppm)
0.0 - 0.3'	Asphalt	
10.0 - 10.3'	Brown, dry, fine sand and silt; little gravel	6.2
10.3 - 12.0'	Buff, gray, tan, dry, gravel; some fine to coarse sand	
15.0 - 17.0'	Olive brown, moist, silt; little fine sand. Varnish or gasoline odor	24
18.0 - 20.0'	Olive brown, wet, silt; little fine sand. Varnish or gasoline odor	32
	Water in augers at 17.0' Set bottom of well screen at 16.5'	

Vapor Well Construction:

Bottom of Boring: 20'
Well Screen: (5') 11.5' - 16.5' - 0.020" slot 4" PVC sch 40
Solid Riser: (13') +1.5' - 11.5' - 4" PVC sch 40
Sand Pack: (7') 9.5' - 16.5'
Bentonite Seal: (9') 0.5' - 9.5'
Backfill: (0.5') 0' - 0.5'
Well Box: None

Dean's Mobil

Well: RW-1

Location: Dean's Mobil, in parking area

Driller: East Coast Drilling and Boring, Inc.

Hydrogeologist: Bill Norland, Lincoln Applied Geology, Inc.

Date: July 9, 1991

Soils Description:

Depth	Description	HNU (ppm)
0.0 - 0.3'	Asphalt	
10.0 - 12.0'	Tan, dry, silt; little fine sand	0.9
15.0 - 17.0'	Green, tan, buff, dry, gravel; some fine to coarse sand. Varnish or paint odor	178
20.0 - 22.0'	Tan, olive, wet, silt; some fine sand; trace of clay (laminated sands and silts). Gasoline odor	105
25.0 - 25.7'	Buff, wet, weathered biotite gneiss bedrock. Gasoline odor	33
25.7 - 27.0'	Green, wet, weathered biotite gneiss bedrock. Gasoline odor	5
	Augered to 29.5' - refusal on bedrock	

Well Construction:

Bottom of Boring: Bedrock refusal at 29.5'
Well Screen: (15') 13.5'-28.5'-0.020" slot 4" PVC sch 40
Solid Riser: (15') +1.5' - 13.5' - 4" PVC sch 40
Sand Pack: (18') 11' - 29'
Bentonite Seal: (11') 0' - 11' and (0.5') 29' - 29.5'
Backfill: None
Well Box: None

Dean's Mobil

Well: RW-2

Location: Dean's Mobil, in parking area

Driller: East Coast Drilling and Boring, Inc.

Hydrogeologist: Bill Norland, Lincoln Applied Geology, Inc.

Date: July 9, 1991

Soils Description:

Depth	Description	HNU (ppm)
0.0 - 0.3′	Asphalt	
10.0 - 10.7′	Tan olive, dry, silt; little fine sand	0.9
10.7 - 12.0′	Green, tan, buff, dry, gravel; some fine to coarse sand	
15.0 - 17.0′	Green, tan, buff, dry, gravel; some fine to coarse sand. Varnish odor	135
20.0 - 22.0′	Tan, wet, fine sand; some silt	0.6
25.0 - 26.25′	Olive tan, wet, silt; little fine sand; trace of clay	0.4
26.25 - 27.0′	Buff, wet, weathered biotite gneiss bedrock	
	Augered to 30′ - refusal on bedrock	

Well Construction:

Bottom of Boring:	Bedrock refusal at 30.0′
Well Screen:	(15′) 14.5′-29.5′-0.020" slot 4" PVC sch 40
Solid Riser:	(16′) +1.5′ - 14.5′ - 4" PVC sch 40
Sand Pack:	(16.5′) 13′ - 29.5′
Bentonite Seal:	(12.5′) 0.5′ - 13′ and (0.2′) 29.5′ - 29.7′
Backfill:	(0.5′) 0 - 0.5′
Well Box:	None

Dean's Mobil

Well: RW-3

Location: Dean's Mobil, in front of building

Driller: East Coast Drilling and Boring, Inc.

Hydrogeologist: Bill Norland, Lincoln Applied Geology, Inc.

Date: July 9 - 10, 1991

Soils Description:

Depth	Description	HNU (ppm)
0.0 - 0.3'	Asphalt	
10.0 - 10.7'	Brown, dry, silt; little fine sand	0.4
10.7 - 12.0'	Brown, dry, gravel; some fine to coarse sand	
15.0 - 17.0'	Brown, dry, gravel; some fine to coarse sand. Gasoline odor	128
20.0 - 22.0	Brown, wet, silt; little fine sand. Gasoline odor	9.2
25.0 - 27.0'	Brown, wet, silt; little fine sand	0.4
30.0 - 32.0'	Olive brown, wet, silt; little fine sand and gravel	0.6

Well Construction:

Bottom of Boring: 32.0'
Well Screen: (15') 14.5'-29.5'-0.020" slot 4" PVC sch 40
Solid Riser: (15.5') +1' - 14.5' - 4" PVC sch 40
Sand Pack: (19') 11' - 30'
Bentonite Seal: (10.5') 0.5' - 11 and (0.25') 30' - 30.25'
Backfill: (0.5') 0 - 0.5'
Well Box: None

Dean's Mobil

Well: RW-4

Location: Dean's Mobil, near slope to CVRR tracks

Driller: East Coast Drilling and Boring, Inc.

Hydrogeologist: Bill Norland, Lincoln Applied Geology, Inc.

Date: July 10, 1991

Soils Description:

Depth	Description	HNU (ppm)
0.0 - 0.3'	Asphalt	
10.0 - 12.0'	Tan brown, dry, fine to medium sand; little coarse sand; trace of fine gravel	0.4
15.0 - 17.0	Tan, buff, green, dry, gravel; some fine to coarse sand. Varnish or gasoline odor	126
20.0 - 21.0'	Brown, wet, fine to coarse sand; some gravel.	88
21.0 - 22.0'	Tan brown, wet, silt; little fine sand (laminated). Gasoline odor	
	Augered to 22.5' - refusal on bedrock	

Well Construction:

Bottom of Boring: Bedrock refusal at 22.5'
Well Screen: (10') 12.5'-22.5'-0.020" slot 4" PVC sch 40
Solid Riser: (13.5') +1' - 12.5' - 4" PVC sch 40
Sand Pack: (11.5') 11' - 22.5'
Bentonite Seal: (10.5') 0.5' - 11'
Backfill: (0.5') 0 - 0.5'
Well Box: None

APPENDIX B

Green Mountain Boring Company

Soil Logs

Green Mountain Boring Co., Inc.

R. D. 2 — BARRE, VERMONT 05641

SHEET 1 OF 7
DATE 6-25-91
HOLE NO. MW-1
LINE & STA.
OFFSET None

TO Lincoln Applied Geology ADDRESS Lincoln, VT
PROJECT NAME Dean's Mobil LOCATION Bethel, VT
REPORT SENT TO L.A.G. and State PROJ. NO.
SAMPLES SENT TO L.A.G. OUR JOB NO. 91-153

GROUND WATER OBSERVATIONS

At ..... at ..... Hours

At ..... at ..... Hours

	CASING	SAMPLER	CORE BAR.
Type	AUGERS	SPLIT SPOON	
Size I. D.	4.25"	1 3/8"	
Hammer Wt.		140#	
Hammer Fall		30"	

SURFACE ELEV.
DATE STARTED 6-25-91
DATE COMPL. 6-25-91
BORING FOREMAN Willard
INSPECTOR
SOILS ENGR. Bill Norland

LOCATION OF BORING: Back of tank next to drop off to R.R. tracks

DEPTH	Casing Blows per foot	Sample Depths From — To	Type of Sample	Blows per 6" on Sampler From 0-6	6-12	To 12-18	Moisture Density or Consist.	Strata Change Elev.	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, condition, hardness, Drilling time, seams and etc.	SAMPLE No.	Pen	Re
		5' - 7'	Dry	2	2	2	Dry		Fine sand fill	1	24"	12"
				2								
								7'	Gravel at 7'			
			Dry						Solid obstruction at 8'. Busted up with point. Drilled to 10'.			
		10' - 12'	Dry	4	4	2	Dry		Fine brown silty sand fill	2	24"	18"
				4								
		15' - 17'	Dry	6	8	7	Dry		Gravel with pebbles and small stone	3	24"	16"
				7								
		20' - 22'	Dry	2		5	Wet		Wet at 19' with product			
				5				18'	gravel into silty sand at 18' with silty sand layers	4	24"	24"
		25' - 26.5'	Dry	70	100	170	Wet to Dry	25'	Wet fine sand wet with product for 7" into dry very DENCE brown weathered rock	5	18"	18"
		30' - 30.5'		18	100	0			Drilled to 30' Dence weathered rock	6	6"	6"
		Drilled to well	35'.	Installed					Materials Used 20' .020 screen 2" p.v.c. 10' Riser 1 bottom cap 1 top cap 6 bags sand 1 bag benseal ½ bag cement 1 curb box			

JUL 10 1991

GROUND SURFACE TO 35' USED AUGERS: THEN Installed well

Sample Type
D = Dry C = Cored W = Washed
UP = Undisturbed Piston
TP = Test Pit A = Auger V = Vane Test
UT = Undisturbed Thinwall

Proportions Used
trace 0 to 10%
little 10 to 20%
some 20 to 35%
and 35 to 50%

140 lb. Wt. x 30" fall an 2" O. D. Sampler

Cohesionless Density
0-10 Loose
10-30 Med. Dense
30-50 Dense
50 + Very Dense

Cohesive Consistency
0-4 Soft
4-8 M/Stiff
8-15 Stiff
15-30 V-Stiff
30 + Hard

SUMMARY:
Earth Boring 35
Rock Coring
Samples 6

HOLE NO. MW-1

Green Mountain Boring Co., Inc.

R. D. 2 — BARRE, VERMONT 05641

SHEET 2 OF 7
DATE 6-25-91
HOLE NO. MW-2
LINE & STA.
OFFSET None

TO Lincoln Applied Geology ADDRESS Lincoln, VT
PROJECT NAME Dean's Mobil LOCATION Bethel, VT
REPORT SENT TO L.A.G. and State PROJ. NO.
SAMPLES SENT TO L.A.G. OUR JOB NO. 91-153

GROUND WATER OBSERVATIONS
At ..... at ..... Hours
At ..... at ..... Hours

	CASING	SAMPLER	CORE BAR.
Type	AUGERS	SPLIT SPOON	
Size I. D.	4.25	1 3/8"	
Hammer Wt.		140#	
Hammer Fall		30"	

SURFACE ELEV.
DATE STARTED 6-25-91
DATE COMPL. 6-26-91
BORING FOREMAN Willard
INSPECTOR
SOILS ENGR. Bill Norland

LOCATION OF BORING: Yard of Hills Fuel and Billings Oil

DEPTH	Casing Blows per foot	Sample Depths From — To	Type of Sample	Blows per 6" on Sampler From 0-6	6-12	To 12-18	Moisture Density or Consist.	Strata Change Elev.	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, condition, hardness, Drilling time, seams and etc.	SAMPLE No.	Pen	Rec
		5' - 7'	Dry	21	6	9	Dry		Stony gravel	1	24"	5"
				8					Stone impeded in nose cone			
		10' - 12'	Dry	14	14	10	Dry		Offset 3' back drilled to		24"	0"
				9					10' - No recovery.			
									Pushed stone			
									Spoon dry			
		15' - 17'	Dry	6	4	1	Dry		Wood trash	0	24"	0"
				1					Old cellar hole			
									No recovery	2	0	6 auger
		20' - 22'	Dry	1	1	5	Saturated	19'	Black product and sand	3	24"	6"
				4					and #2 fuel			
		25' - 27'	Dry	11	10	8	Saturated	26'	Area into wet brown sand	4	24"	8"
				8					at 26'			
		30' - 32'	Dry	6	15	10			Brown very fine sand with	5	12"	8"
				11					medium coarse sand pockets			
									Some stone and organic	6	12"	8"
									Installed well			
									Materials Used			
									20' .020 2" p.v.c. screen			
									10' riser			
									5 sand			
									3/4 bag bentonite			
									½ bag cement			
									1 cap - push on			
									1 cap - wing			
									1 curb box			

JUL 10 1991

GROUND SURFACE TO 30' USED AUGERS: THEN Installed well

Sample Type
D=Dry C=Cored W=Washed
UP=Undisturbed Piston
TP=Test Pit A=Auger V=Vane Test
UT=Undisturbed Thinwall

Proportions Used
trace 0 to 10%
little 10 to 20%
some 20 to 35%
and 35 to 50%

140 lb. Wt. x 30" fall on 2" O. D. Sampler

Cohesionless Density		Cohesive Consistency	
0-10	Loose	0-4	Soft
10-30	Med. Dense	4-8	M/Stiff
30-50	Dense	8-15	Stiff
50 +	Very Dense	15-30	V-Stiff
		30 +	Hard

SUMMARY:
Earth Boring 32
Rock Coring
Samples 6

HOLE NO. MW-2

Green Mountain Boring Co., Inc.

R. D. 2 — BARRE, VERMONT 05641

SHEET 3 OF 7
DATE 6-26-91
HOLE NO. MW-3
LINE & STA.
OFFSET None

TO Lincoln Applied Geology ADDRESS Lincoln, VT
PROJECT NAME Dean's Mobil LOCATION Bethel, VT
REPORT SENT TO L.A.G. and State PROJ. NO.
SAMPLES SENT TO L.A.G. OUR JOB NO. 91-153

GROUND WATER OBSERVATIONS
At ..... at ..... Hours
At ..... at ..... Hours

	CASING	SAMPLER	CORE BAR.
Type	AUGERS	SPLIT SPOON	
Size I. D.	4.25	1 3/8"	
Hammer Wt.		140#	
Hammer Fall		30"	

SURFACE ELEV.
DATE STARTED 6-26-91
DATE COMPL. 6-26-91
BORING FOREMAN Willard
INSPECTOR
SOILS ENGR. Bill Norland

LOCATION OF BORING: R.R. Property N. well

DEPTH	Casing Blows per foot	Sample Depths From — To	Type of Sample	Blows per 6" on Sampler From 0-6	From 6-12	To 12-18	Moisture Density or Consist.	Strata Change Elev.	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, condition, hardness, Drilling time, seams and etc.	SAMPLE No.	Pen	Re
		5' - 7'	Dry	5 4	5	3	Damp		1' railroad ash into medium grain sand	1 2	12" 12"	10" 10"
		10' - 12'	Dry	9 6	11	9	Dry		Medium grain sand with Pebbles	3	24"	15"
		15' - 17'	Dry	13 22	39	24	Dry		Medium grain sand with fractured rock with mica particles	4	24"	13'
		20' - 22'	Dry	7 16	22	16		Wet 21'	Very slow hard drilling 17' - 20' very fine sand with stone fragments into very fine sandy silt	5	24"	15'
									Auger refusal at 22.5' on bed rock. Spoon bounce Installed well			
									Materials Used 10" .020 p.v.c. screen 12' 2" p.v.c. riser 1 push cap 1 wing cap 3½ bags sand #2 silica 1 bag bentonite ½ bag cement 1 curb box 1 2" cupling			

GROUND SURFACE TO 22.5' USED AUGERS: THEN Installed well

Sample Type
D = Dry C = Cored W = Washed
UP = Undisturbed Piston
TP = Test Pit A = Auger V = Vane Test
UT = Undisturbed Thinwall

Proportions Used
trace 0 to 10%
little 10 to 20%
some 20 to 35%
and 35 to 50%

140 lb. Wt. x 30" fall an 2" O. D. Sampler

Cohesionless Density		Cohesive Consistency		
0-10	Loose	0-4	Soft	30 + Hard
10-30	Med. Dense	4-8	M/Stiff	
30-50	Dense	8-15	Stiff	
50 +	Very Dense	15-30	V-Stiff	

SUMMARY:
Earth Boring 22
Rock Coring
Samples 5

HOLE NO MW-3

Green Mountain Boring Co., Inc.

R. D. 2 — BARRE, VERMONT 05641

SHEET 4 OF 7
DATE 6-26-91
HOLE NO. MW-4
LINE & STA.
OFFSET None

TO Lincoln Applied Geology ADDRESS Lincoln, VT
PROJECT NAME Dean's Mobil LOCATION Bethel, VT
REPORT SENT TO L.A.G. & State PROJ. NO.
SAMPLES SENT TO L.A.G. OUR JOB NO. 91-153

GROUND WATER OBSERVATIONS

At ..... at ..... Hours

At ..... at ..... Hours

	CASING	SAMPLER	CORE BAR.
Type	AUGERS	SPLIT SPOON	
Size I. D.	4.25	1⅜"	
Hammer Wt.		140#	
Hammer Fall		30"	

SURFACE ELEV.
DATE STARTED 6-26-91
DATE COMPL. 6-26-91
BORING FOREMAN Willard
INSPECTOR
SOILS ENGR. Bill Norland

LOCATION OF BORING: R. R. land S. Boring

DEPTH	Casing Blows per foot	Sample Depths From — To	Type of Sample	Blows per 6" on Sampler From 0-6	6-12	To 12-18	Moisture Density or Consist.	Strata Change Elev.	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, condition, hardness, Drilling time, seams and etc.	SAMPLE No.	Pen	Re
		5' - 7'	Dry	11	14	9	Dry		Cinders coal	1	24"	24"
				8					7" into small stone gravel			
		10' - 12'	Dry	11	14	9	Dry		Sand with small stone	2	24"	13"
				8					gravel			
		15' - 17'	Dry	6	8	7	Dry		Sandy gravel	3	24"	17"
				25								
		18' - 20'	Dry	32	33	34	Dry		Misc fractured rock	4	24"	16"
				29					sand stone and gravel			
		20' - 22'		19	20	21			Hard stoney gravel with	5	24"	16"
				22					layers of silt clay and			
									fractured rock	5	A	
									Auger refusal at 22'			
									Set well			

Materials Used

10' 2" p.v.c. .020 screen
12' riser
3½ bags of silica sand
1 top wing
1 bottom dish
1 cupling
1 bag bentonite
½ bag cement
1 curb box

GROUND SURFACE TO 22' USED 4.25 AUGERS: THEN Set well

Sample Type
D = Dry C = Cored W = Washed
UP = Undisturbed Piston
TP = Test Pit A = Auger V = Vane Test
UT = Undisturbed Thinwall

Proportions Used
trace 0 to 10%
little 10 to 20%
some 20 to 35%
and 35 to 50%

140 lb. Wt. x 30" fall on 2" O. D. Sampler

Cohesionless Density
0-10 Loose
10-30 Med. Dense
30-50 Dense
50 + Very Dense

Cohesive Consistency
0-4 Soft
4-8 M/Stiff
8-15 Stiff
15-30 V-Stiff
30 + Hard

SUMMARY:
Earth Boring 22
Rock Coring
Samples 6

HOLE NO. MW-4

Green Mountain Boring Co., Inc.

R. D. 2 — BARRE, VERMONT 05641

SHEET 5 OF 7
DATE 6-27-91
HOLE NO. MW-5
LINE & STA.
OFFSET None

TO Lincoln Applied Geology ADDRESS Lincoln, VT
PROJECT NAME Dean's Mobil LOCATION Bethel, VT
REPORT SENT TO L.A.G. and State PROJ. NO.
SAMPLES SENT TO L.A.G. OUR JOB NO. 91-153

GROUND WATER OBSERVATIONS	CASING	SAMPLER	CORE BAR.
At ..... at ..... Hours	Type	AUGERS	SPLIT SPOON
	Size I. D.	4.25	1 3/8"
At ..... at ..... Hours	Hammer Wt.		140#
	Hammer Fall		30"

SURFACE ELEV.
DATE STARTED 6-27-91
DATE COMPL. 6-27-91
BORING FOREMAN Bernasconi
INSPECTOR
SOILS ENGR.

LOCATION OF BORING: In station yard

DEPTH	Casing Blows per foot	Sample Depths From — To	Type of Sample	Blows per 6" on Sampler From 0-6	From 6-12	To 12-18	Moisture Density or Consist.	Strata Change Elev.	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, condition, hardness, Drilling time, seams and etc.	SAMPLE No.	Pen	Re
		5' - 7'	D	4	3	4	Dry		Sandy gravel	1	24"	11'
				4								
		10' - 12'	D	15	23	24	Dry		Sandy gravel and some large stone	2	24"	20'
				15								
		15' - 17'	D	13	10	6	Dry		Coarse sandy gravel Crush stone	3	24"	13'
				12								
		17' - 19'	D	13	6	4	Wet		Fine brown sand	4	24"	18'
				6								
		20' - 22'	D	7	4	3	Wet		Fine brown sand	5	24"	11'
				10								
		25' - 27'	D	136	for	6"	Wet		Weathered rock	6	6"	6"
									Set well at 25'			

Materials Used

20' .010 screen
5' riser
7 bags of silica sand
½ bag of Bentonite
1 flush curb box
½ bag of cement
1 push on cap
1 wing type cap

GROUND SURFACE TO 25' USED 4.25 AUGERS: THEN split spoon and set well

Sample Type
D = Dry C = Cored W = Washed
UP = Undisturbed Piston
TP = Test Pit A = Auger V = Vane Test
UT = Undisturbed Thinwall

Proportions Used
trace 0 to 10%
little 10 to 20%
some 20 to 35%
and 35 to 50%

140 lb. Wt. x 30" fall an 2" O. D. Sampler
Cohesionless Density: 0-10 Loose; 10-30 Med. Dense; 30-50 Dense; 50 + Very Dense
Cohesive Consistency: 0-4 Soft; 4-8 M/Stiff; 8-15 Stiff; 15-30 V-Stiff; 30 + Hard

SUMMARY:
Earth Boring 25
Rock Coring
Samples 6

HOLE NO. MW-5

Green Mountain Boring Co., Inc.

R. D. 2 — BARRE, VERMONT 05641

SHEET 6 OF 7
DATE 6-27-91
HOLE NO. MW-6
LINE & STA.
OFFSET None

TO Lincoln Applied Geology ADDRESS Lincoln, VT
PROJECT NAME Dean's Mobil LOCATION Bethel, VT
REPORT SENT TO L.A.G. and State PROJ. NO.
SAMPLES SENT TO L.A.G. OUR JOB NO. 91-153

GROUND WATER OBSERVATIONS	CASING	SAMPLER	CORE BAR.
At ... at ... Hours	Type AUGERS 4.25	SPLIT SPOON	
At ... at ... Hours	Size I. D.	1 3/8"	
	Hammer Wt.	140#	
	Hammer Fall	30"	

SURFACE ELEV.
DATE STARTED 6-27-91
DATE COMPL. 6-27-91
BORING FOREMAN Bernasconi
INSPECTOR
SOILS ENGR.

LOCATION OF BORING: Station yard between island and road

DEPTH	Casing Blows per foot	Sample Depths From — To	Type of Sample	Blows per 6" on Sampler From 0-6	6-12	To 12-18	Moisture Density or Consist.	Strata Change Elev.	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, condition, hardness, Drilling time, seams and etc.	SAMPLE No.	Pen	Rec
		5' - 7'	D	7	3	4	Moist		Very fine silty sand	1	24"	18"
				5								
		10' - 12'	D	9	8	7	Dry		Coarse sandy gravel	2	24"	15"
				5								
		15' - 17'	D	7	3	3	Wet		Fine silty sand	3	24"	18"
				4								
		20' - 22'	D	10	20	13	Wet		Silty fine sand and some gravel. Trace of clay	4	24"	16"
				13								
		25' - 27'	D	23	50	100 for 3"	Wet		Silty sand and weathered stone	5	24"	19"
									Set well at 25'			
									Materials Used			
									20' .010 screen			
									5' riser			
									1 push on cap			
									1 wing cap			
									1 flush curb box			
									1 bag of cement			
									6 bags of silica sand			

JUL 10 1991

GROUND SURFACE TO 25' USED 4.25 AUGERS: THEN Split spoon and set well

Sample Type
D = Dry C = Cored W = Washed
UP = Undisturbed Piston
TP = Test Pit A = Auger V = Vane Test
UT = Undisturbed Thinwall

Proportions Used
trace 0 to 10%
little 10 to 20%
some 20 to 35%
and 35 to 50%

140 lb. Wt. x 30" fall on 2" O. D. Sampler

Cohesionless Density
0-10 Loose
10-30 Med. Dense
30-50 Dense
50 + Very Dense

Cohesive Consistency
0-4 Soft
4-8 M/Stiff
8-15 Stiff
15-30 V-Stiff
30 + Hard

SUMMARY:
Earth Boring 25'
Rock Coring
Samples 5

HOLE NO. MW-6

Green Mountain Boring Co., Inc.

R. D. 2 — BARRE, VERMONT 05641

SHEET 7 OF 7
DATE 6-28-91
HOLE NO. MW-7
LINE & STA.
OFFSET None

TO Lincoln Applied Geology ADDRESS Lincoln, VT
PROJECT NAME Dean's Mobil LOCATION Bethel, VT
REPORT SENT TO L.A.G. and State PROJ. NO.
SAMPLES SENT TO L.A.G. OUR JOB NO. 91-153

GROUND WATER OBSERVATIONS
At 18' at 1/2 Hours
At ..... at ..... Hours

	CASING	AUGERS	SAMPLER SPLIT SPOON	CORE BAR.
Type		AUGERS	SPLIT SPOON	
Size I. D.		4.25	1 3/8"	
Hammer Wt.			140#	
Hammer Fall			30"	

SURFACE ELEV.
DATE STARTED 6-28-91
DATE COMPL. 6-28-91
BORING FOREMAN Garneau
INSPECTOR
SOILS ENGR.

LOCATION OF BORING: As shown next to auto parts store

DEPTH	Casing Blows per foot	Sample Depths From — To	Type of Sample	Blows per 6" on Sampler From 0-6	6-12	To 12-18	Moisture Density or Consist.	Strata Change Elev.	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, condition, hardness, Drilling time, seams and etc.	SAMPLE No.	Pen	Re
		5' - 7'	Dry	1	0	1	Dry		Fine silty sand	1	24"	16"
				0								
		10' - 12'	Dry	2	5	9	Dry		Silty sand with some gravel	2	24"	14"
				9								
		15' - 17'	Dry	6	6	4	Dry		Fine sand with gravel	3	24"	12"
				2								
		17' - 19'	Dry	4	3	2	Wet		Silty fine sand	4	24"	14"
				2								
		20' - 22'	Dry	6	8	9	Wet		Fine sand with some silt with some weathered bedrock	5	24"	20"
				91								
		22' - 24'	Dry	16	7	9	Wet		Fine sand with silt and weathered stones	6	24"	16"
				25								
		25' - 27'	Dry	13	16	11	Wet		Fine sand with silt and weathered stones	7	24"	14"
				13								
									Set well at 25'			

Materials Used

20' .010 screen
5' riser
1 slip bottom cap
1 wing cap
1 curb box
½ bag cement
½ bag bentonite
8 bags of silica sand

JUL 10 1991

GROUND SURFACE TO 25' USED 4.25 AUGERS: THEN Split spoon and installed well

Sample Type
D = Dry C = Cored W = Washed
UP = Undisturbed Piston
TP = Test Pit A = Auger V = Vane Test
UT = Undisturbed Thinwall

Proportions Used
trace 0 to 10%
little 10 to 20%
some 20 to 35%
and 35 to 50%

140 lb. Wt. x 30" fall an 2" O. D. Sampler
Cohesionless Density
0-10 Loose
10-30 Med. Dense
30-50 Dense
50 + Very Dense

Cohesive Consistency
0-4 Soft
4-8 M/Stiff
8-15 Stiff
15-30 V-Stiff
30 + Hard

SUMMARY:
Earth Boring 25'
Rock Coring
Samples 7

HOLE NO. MW-7

APPENDIX C

East Coast Drilling and Boring

Soil Logs

EAST COAST DRILLING & BORING

Subsurface Investigations
Specializing in Ground Water Monitoring Wells

(800) 451-2835
FAX (203) 269-0847

TRANSMITAL SHEET

Subject: Recovery Wells/Vapor Wells
Dean's Mobil Station

Location: Bethel, VT

Job Number: 91V-101

Project or Contract Number:

Date: 7/11/91

Purchase Order Number:

Attention of: Steve LaRossa

To: Lincoln Applied Geology
RD #1 - Box 710
Briston, VT 05443

Copies/or Sets	DESCRIPTION
1	Copy of boring reports hole numbers: VP-1, VP-2, VP-3, VP-3A, RW-1, RW-2, RW-3 and RW-4.

SAMPLES:

CORE BOXES:

By: Lisa Cotter
Lisa Cotter

Home Office:
East Coast Drilling & Boring, Inc.
77 North Plains Industrial Road
P.O. Box 961
Wallingford, CT 06492
(203) 269-9160

East Coast Drilling & Boring of Vermont, Inc.
P.O. Box 441
Derby, VT 05829
(802) 766-4928

East Coast Drilling & Boring, Inc.

P.O. BOX 961 • WALLINGFORD, CT 06492

Bit # _____ Ftg. _____

Bit # _____ Ftg. _____

SHEET 1 OF 1

DATE 7/11/91

HOLE NO. VP-1

LINE & STA. _____

OFFSET _____

TO Lincoln Applied Geology

PROJECT NAME Dean's Mobil Station

REPORT SENT TO Client

SAMPLES SENT TO Taken at Site

ADDRESS Briston, VT

LOCATION Bethel, VT

PROJ. NO. _____

OUR JOB NO. 91V-101

GROUND WATER OBSERVATIONS

At 18.0' after 0 Hours

At _____ after _____ Hours

	CASING	SAMPLER	CORE BAR.
Type	HSA	S-S	
Size I.D.	6 1/4"	1 3/8"	
Hammer Wt.		140lbs.	BIT
Hammer Fall		30"	

SURFACE ELEV. _____

DATE STARTED 7/8/91

DATE COMPL. 7/8/91

BORING FOREMAN Brett Swiatek

INSPECTOR Bill Norland

SOILS ENGR. _____

LOCATION OF BORING _____

DEPTH	Casing Blows per foot	Sample Depths From - To	Type of Sample	Blows per 6" on Sampler From 0-6	To 6-12	To 12-18	Moisture Density or Consist.	Strata Change Elev.	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, condition, hardness, Drilling time, seams and etc.	SAMPLE No.	Pen	Rec.
									Augered to 10.0'			
		10.0' - 12.0'	D	1	1	2	Dry		Light Brown fine Sand, trace fine	1	2.0'	1.3'
						3	Loose	11.5'	Gravel.			
									Brown fine medium Sand, trace fine Gravel.			
		15.0' - 17.0'	D	2	4	8	Dry		Brown medium coarse Sand, trace	2	2.0'	1.3'
						8	M.Dense		fine medium Sand, Slight Odor.			
		18.0' - 20.0'	D	7	4	3	Wet		Brown Silt and fine Sand, trace	3	2.0'	1.0'
						4	Loose	20.0'	fine Gravel (Slight Odor).			
									Bottom of Boring 20.0'			
									Installed 4" PVC Monitor Well at 17.0' with 2.0' Stickup			
									10.0' Screen 10.0' Riser 500lbs. Ottawa Sand 1 Threaded Plug 1 1/2 Pail Bentonite Pellets			

RECEIVED JUL 1991 LINCOLN APPLIED GEOLOGY, IN

GROUND SURFACE TO 18.0' USED HSA "CASING: THEN Sampled to 20.0'

Sample Type
D=Dry C=Cored W=Washed
UP=Undisturbed Piston
TP=Test Pit A=Auger V=Vane Test
UT=Undisturbed Thinwall

Proportions Used
trace 0 to 10%
little 10 to 20%
some 20 to 35%
and 35 to 50%

140lb Wt. x 30" fall on 2" O.D. Sampler

Cohesionless Density		Cohesive Consistency		
0-10	Loose	0-4	Soft	30 + Hard
10-30	Med. Dense	4-8	M/Stiff	
30-50	Dense	8-15	Stiff	
50 +	Very Dense	15-30	V-Stiff	

SUMMARY:
Earth Boring 20.0'
Rock Coring _____
Samples 3

HOLE NO VP-1

East Coast Drilling & Boring, Inc.

P.O. BOX 961 • WALLINGFORD, CT 06492

Bit # _____ Ftg. _____

Bit # _____ Ftg. _____

SHEET 1 OF 1

DATE 7/11/91

HOLE NO. VP-2

LINE & STA. _____

OFFSET _____

TO Lincoln Applied Geology

ADDRESS Briston, VT

PROJECT NAME Dean's Mobil Station

LOCATION Bethel, VT

REPORT SENT TO Client

PROJ. NO. _____

SAMPLES SENT TO Taken at Site

OUR JOB NO. 91V-101

GROUND WATER OBSERVATIONS

At 18.0' after 0 Hours

At _____ after ___ ___ Hours

	CASING	SAMPLER	CORE BAR.
Type	HSA	S-S	
Size I.D.	6 1/4"	1 3/8"	
Hammer Wt.		140lbs.	BIT
Hammer Fall		30"	

SURFACE ELEV. _____

DATE STARTED 7/8/91

DATE COMPL. 7/8/91

BORING FOREMAN Brett Swiatek

INSPECTOR Bill Norland

SOILS ENGR. _____

LOCATION OF BORING: _____

DEPTH	Casing Blows per foot	Sample Depths From - To	Type of Sample	Blows per 6" on Sampler From 0-6	To 6-12	To 12-18	Moisture Density or Consist.	Strata Change Elev.	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, condition, hardness, Drilling time, seams and etc.	SAMPLE No.	Pen	Rec.
									Augered to 10.0'			
		10.0' - 12.0'	D	10	12	8	Dry		Brown fine medium Sand, little fine	1	2.0'	1.7'
						9	M.Dense		Gravel (Slight Odor).			
		15.0' - 17.0'	D	4	6	10	Dry		Brown fine medium Sand, little fine	2	2.0'	1.0'
						10	M.Dense		medium Gravel (Slight Odor).			
		18.0' - 20.0'	D	2	3	3	Wet		Brown Silty fine Sand.	3	2.0'	1.6'
						4	Loose					
								20.0'				
									Bottom of Boring 20.0'			
									Installed 4" PVC Monitor Well at			
									17.0' with 2.0' Stickup			
									10.0' Screen			
									10.0' Riser			
									500lbs. Ottawa Sand			
									1 Bag Volclay Grout			
									1 Bag Initiator			

RECEIVED OCT 1 1991

LINCOLN APPLIED GEOLOGY INC.

GROUND SURFACE TO 18.0' USED HSA "CASING: THEN Sampled to 20.0'

Sample Type
D=Dry C=Cored W=Washed
UP=Undisturbed Piston
TP=Test Pit A=Auger V=Vane Test
UT=Undisturbed Thinwall

Proportions Used
trace 0 to 10%
little 10 to 20%
some 20 to 35%
and 35 to 50%

140lb Wt. x 30" fall on 2" O.D. Sampler

Cohesionless Density		Cohesive Consistency	
0-10	Loose	0-4	Soft
10-30	Med. Dense	4-8	M/Stiff
30-50	Dense	8-15	Stiff
50+	Very Dense	15-30	V-Stiff
		30+	Hard

SUMMARY:
Earth Boring 20.0'
Rock Coring _____
Samples 3

HOLE NO VP-2

East Coast Drilling & Boring, Inc.

P.O. BOX 961 • WALLINGFORD, CT 06492

Bit # _____ Ftg. _____

Bit # _____ Ftg. _____

SHEET 1 OF 1

TO Lincoln Applied Geology | ADDRESS Briston, VT | DATE 7/11/91

PROJECT NAME Dean's Mobil Station | LOCATION Bethel, VT | HOLE NO. VP-3

REPORT SENT TO Client | PROJ. NO. _____ | LINE & STA. _____

SAMPLES SENT TO Taken at Site | OUR JOB NO. 91V-101 | OFFSET _____

GROUND WATER OBSERVATIONS

At None after 0 Hours

At _____ after _____ Hours

	CASING	SAMPLER	CORE BAR.
Type	HSA	S-S	
Size I.D.	6 1/4"	1 3/8"	
Hammer Wt.		140lbs.	BIT
Hammer Fall		30"	

SURFACE ELEV. _____

DATE STARTED 7/9/91

DATE COMPL. 7/9/91

BORING FOREMAN Brett Swiatek

INSPECTOR Bill Norland

SOILS ENGR. _____

LOCATION OF BORING: _____

DEPTH	Casing Blows per foot	Sample Depths From - To	Type of Sample	Blows per 6" on Sampler From 0-6	To 6-12	To 12-18	Moisture Density or Consist.	Strata Change Elev.	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, condition, hardness, Drilling time, seams and etc.	SAMPLE No.	Pen	Rec.
									Dug a 3' wide hole and 4' deep pit by hand due to electric lines being in the way. We had to move back 4' and do the same thing. We dug to 3.5' then got auger refusal at 4.5' and back filled hole.			
								4.5'	NO SAMPLES TAKEN			
									Auger Refusal at 4.5'			

RECEIVED JUL 1 1991

GROUND SURFACE TO 4.5' USED HSA "CASING: THEN Auger Refusal at 4.5'

Sample Type
D=Dry C=Cored W=Washed
UP=Undisturbed Piston
TP=Test Pit A=Auger V=Vane Test
UT=Undisturbed Thinwall

Proportions Used
trace 0 to 10%
little 10 to 20%
some 20 to 35%
and 35 to 50%

140lb Wt. x 30" fall on 2" O.D. Sampler

Cohesionless Density		Cohesive Consistency		
0-10	Loose	0-4	Soft	30 + Hard
10-30	Med. Dense	4-8	M/Stiff	
30-50	Dense	8-15	Stiff	
50 +	Very Dense	15-30	V-Stiff	

SUMMARY
Earth Boring 4.5'
Rock Coring _____
Samples 0

HOLE NO VP-3

East Coast Drilling & Boring, Inc.

P.O. BOX 961 • WALLINGFORD, CT 06492

Bit # ____ Ftg. ____

Bit # ____ Ftg. ____

SHEET 1 OF 1

TO Lincoln Applied Geology | ADDRESS Briston, VT | DATE 7/11/91

PROJECT NAME Dean's Mobil Station | LOCATION Bethel, VT | HOLE NO. VP-3A

REPORT SENT TO Client | PROJ. NO. | LINE & STA.

SAMPLES SENT TO Taken at Site | OUR JOB NO. 91V-101 | OFFSET

GROUND WATER OBSERVATIONS

At 17.0' after 0 Hours

At ____ after ____ Hours

	CASING	SAMPLER	CORE BAR.
Type	HSA	S-S	
Size I.D.	6 1/4"	1 3/8"	
Hammer Wt.		140lbs.	BIT
Hammer Fall		30"	

SURFACE ELEV. ____

DATE STARTED 7/10/91

DATE COMPL. 7/10/91

BORING FOREMAN Brett Swiatek

INSPECTOR Bill Norland

SOILS ENGR. ____

LOCATION OF BORING: ____

DEPTH	Casing Blows per foot	Sample Depths From - To	Type of Sample	Blows per 6" on Sampler From 0-6	To 6-12	To 12-18	Moisture Density or Consist.	Strata Change Elev.	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, condition, hardness, Drilling time, seams and etc.	SAMPLE No.	Pen	Rec.
									Augered to 10.0'			
		10.0' - 12.0'	D	3	10	12	Dry		Brown fine coarse Sand and fine	1	2.0'	1.2'
						10	M.Dense		coarse Gravel.			
		15.0' - 17.0'	D	2	5	5	Wet		Brown Silt and fine Sand.	2	2.0'	1.8'
						7	M.Dense					
		18.0' - 20.0'	D	5	6	9	Wet		" "	3	2.0'	1.5'
						9	M.Dense					
								20.0'				
									Bottom of Boring 20.0'			
									Installed 4" PVC Monitor Well at			
									16.5' with .5' Stickup			
									5.0' Screen			
									17.0' Riser			
									400lbs. Ottawa Sand			
									1 Threaded Plug			
									1 Bag Voclay Grout			
									1 Bag Initiator			

RECEIVED JUL 1991 LINCOLN APPLIED GE

GROUND SURFACE TO 18.0' USED HSA "CASING: THEN Sampled to 20.0'

Sample Type
D=Dry C=Cored W=Washed
UP=Undisturbed Piston
TP=Test Pit A=Auger V=Vane Test
UT=Undisturbed Thinwall

Proportions Used
trace 0 to 10%
little 10 to 20%
some 20 to 35%
and 35 to 50%

140lb Wt. x 30" fall on 2" O.D. Sampler

Cohesionless Density
0-10 Loose
10-30 Med. Dense
30-50 Dense
50 + Very Dense

Cohesive Consistency
0-4 Soft
4-8 M/Stiff
8-15 Stiff
15-30 V-Stiff
30 + Hard

SUMMARY
Earth Boring 20.0'
Rock Coring ____
Samples 3

HOLE NO VP-3A

East Coast Drilling & Boring, Inc.

P.O. BOX 961 • WALLINGFORD, CT 06492

Bit # _____ Ftg. _____

Bit # _____ Ftg. _____

SHEET 1 OF 1

DATE 7/11/91

HOLE NO. RW-1

LINE & STA. _____

OFFSET _____

TO Lincoln Applied Geology

PROJECT NAME Dean's Mobil Station

REPORT SENT TO Client

SAMPLES SENT TO Taken at Site

ADDRESS Briston, VT

LOCATION Bethel, VT

PROJ. NO. _____

OUR JOB NO. 91V-101

GROUND WATER OBSERVATIONS

At 18.0' after 0 Hours

At _____ after ___ Hours

	CASING	SAMPLER	CORE BAR.
Type	HSA	S-S	
Size I.D.	6 1/4"	1 3/8"	
Hammer Wt.		140lbs.	BIT
Hammer Fall		30"	

SURFACE ELEV. _____

DATE STARTED 7/9/91

DATE COMPL. 7/9/91

BORING FOREMAN Brett Swiatek

INSPECTOR Bill Norland

SOILS ENGR. _____

LOCATION OF BORING: _____

DEPTH	Casing Blows per foot	Sample Depths From - To	Type of Sample	Blows per 6" on Sampler From 0-6	To 6-12	To 12-18	Moisture Density or Consist.	Strata Change Elev.	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, condition, hardness, Drilling time, seams and etc.	SAMPLE No.	Pen	Rec.
									Augered to 10.0'			
		10.0' - 12.0'	D	1	3	3	Dry		Brown medium coarse Sand, little	1	2.0'	2.0'
						3	Loose		fine medium Gravel.			
		15.0' - 17.0'	D	4	4	5	Dry		Brown fine coarse Sand, trace fine	2	2.0'	1.3'
						8	M.Dense		Gravel (Slight Odor).			
		20.0' - 22.0'	D	1	2	3	Wet		Brown Silty, some fine Sand, trace	3	2.0'	1.6'
						4	Loose		Clay (Slight Odor).			
		25.0' - 27.0'	D	25	44	44	Wet		Weathered Bedrock Rock.	4	2.0'	1.6'
						55	V.Dense					
								29.5'				
									Bottom of Boring 29.5'			
									Installed 4" PVC Monitor Well at			
									28.5' with a 1.5' Stickup			
									15.0' Screen			
									15.0' Riser			
									700lbs. Ottawa Sand			
									1 Threaded Plug			
									1 Bag Voclay Grout			
									1 Bag Initiator			

GROUND SURFACE TO 29.5' USED HSA "CASING: THEN Bottom of Boring 29.5'

Sample Type
D=Dry C=Cored W=Washed
UP=Undisturbed Piston
TP=Test Pit A=Auger V=Vane Test
UT=Undisturbed Thinwall

Proportions Used
trace 0 to 10%
little 10 to 20%
some 20 to 35%
and 35 to 50%

140lb Wt. x 30" fall on 2" O.D. Sampler

Cohesionless Density
0-10 Loose
10-30 Med. Dense
30-50 Dense
50 + Very Dense

Cohesive Consistency
0-4 Soft
4-8 M/Stiff
8-15 Stiff
15-30 V-Stiff
30 + Hard

SUMMARY:
Earth Boring 29.5'
Rock Coring ___
Samples 4

HOLE NO RW-1

East Coast Drilling & Boring, Inc.

P.O. BOX 961 • WALLINGFORD, CT 06492

Bit # _____ Ftg. _____

Bit # _____ Ftg. _____

SHEET 1 OF 1

DATE 7/11/91

HOLE NO. RW-2

LINE & STA. _____

OFFSET _____

TO Lincoln Applied Geology

PROJECT NAME Dean's Mobil Station

REPORT SENT TO Client

SAMPLES SENT TO Taken at Site

ADDRESS Briston, VT

LOCATION Bethel, VT

PROJ. NO. _____

OUR JOB NO. 91V-101

GROUND WATER OBSERVATIONS

At 18.0' after 0 Hours

At _____ after ___ Hours

	CASING	SAMPLER	CORE BAR.
Type	HSA	S-S	
Size I.D.	6 1/4"	1 3/8"	
Hammer Wt.		140lbs.	BIT
Hammer Fall		30"	

SURFACE ELEV. _____

DATE STARTED 7/9/91

DATE COMPL. 7/9/91

BORING FOREMAN Brett Swiatek

INSPECTOR Bill Norland

SOILS ENGR. _____

LOCATION OF BORING: _____

DEPTH	Casing Blows per foot	Sample Depths From - To	Type of Sample	Blows per 6" on Sampler From 0-6	To 6-12	To 12-18	Moisture Density or Consist.	Strata Change Elev.	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, condition, hardness, Drilling time, seams and etc.	SAMPLE No.	Pen	Rec.
									Augered to 10.0'			
		10.0' - 12.0'	D	9	9	9	Damp		Brown Silt and fine Sand.	1	2.0'	1.9'
						9	M.Dense	10.5'				
									Brown fine coarse Sand, little fine medium Gravel.			
		15.0' - 17.0'	D	3	4	4	Damp		" "	2	2.0'	1.0'
						5	Loose					
		20.0' - 22.0'	D	4	4	5	Wet		Brown fine Sand, little Silt.	3	2.0'	1.5'
						5	Loose					
		25.0' - 27.0'	D	14	7	30	Wet		" "	4	2.0'	1.0'
						35	V.Dense	26.7'				
									Weathered Rock.			
								30.0'				
									Bottom of Boring 30.0'			
									Installed 4" PVC Monitor Well at 29.5' with a .5 Stickup			
									15.0' Screen			
									15.0' Riser			
									1 Threaded Plug			
									700lbs. Ottawa Sand			
									1 Bag Voclay Grout			
									1 Bag Initiator			

GROUND SURFACE TO 30.0' USED HSA "CASING: THEN Bottom of Boring 30.0'

Sample Type
D=Dry C=Cored W=Washed
UP=Undisturbed Piston
TP=Test Pit A=Auger V=Vane Test
UT=Undisturbed Thinwall

Proportions Used
trace 0 to 10%
little 10 to 20%
some 20 to 35%
and 35 to 50%

140lb Wt. x 30" fall on 2" O.D. Sampler
Cohesionless Density: 0-10 Loose; 10-30 Med. Dense; 30-50 Dense; 50+ Very Dense
Cohesive Consistency: 0-4 Soft; 4-8 M/Stiff; 8-15 Stiff; 15-30 V-Stiff; 30+ Hard

SUMMARY
Earth Boring 30.0'
Rock Coring ____
Samples 4

HOLE NO RW-2

East Coast Drilling & Boring, Inc.

P.O. BOX 961 • WALLINGFORD, CT 06492

Bit # ____ Ftg. ____

Bit # ____ Ftg. ____

SHEET 1 OF 1

TO Lincoln Applied Geology | ADDRESS Briston, VT | DATE 7/11/91

PROJECT NAME Dean's Mobil Station | LOCATION Bethel, VT | HOLE NO. RW-3

REPORT SENT TO Client | PROJ. NO. | LINE & STA.

SAMPLES SENT TO Taken at Site | OUR JOB NO. 91V-101 | OFFSET

GROUND WATER OBSERVATIONS

At 18.0' after 0 Hours

At ____ after ____ Hours

	CASING	SAMPLER	CORE BAR.
Type	HSA	S-S	
Size I.D.	6 1/4"	1 3/8"	
Hammer Wt.		140lbs.	BIT
Hammer Fall		30"	

SURFACE ELEV. ____

DATE STARTED 7/9/91

DATE COMPL. 7/10/91

BORING FOREMAN Brett Swiatek

INSPECTOR Bill Norland

SOILS ENGR. ____

LOCATION OF BORING: ____

DEPTH	Casing Blows per foot	Sample Depths From - To	Type of Sample	Blows per 6" on Sampler From 0-6	To 6-12	To 12-18	Moisture Density or Consist.	Strata Change Elev.	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, condition, hardness, Drilling time, seams and etc.	SAMPLE No.	Pen	Rec.
									Augered to 10.0'			
		10.0' - 12.0'	D	3	4	4	Dry		Brown fine coarse Sand, little	1	2.0'	1.5'
						5	Loose		medium coarse Gravel.			
		15.0' - 17.0'	D	4	7	7	Dry		" "	2	2.0'	1.0'
						7	M.Dense					
		20.0' - 22.0'	D	2	5	5	Wet		Brown Silty fine Sand.	3	2.0'	1.5'
						10	M.Dense					
		25.0' - 27.0'	D	5	6	7	Wet		" "	4	2.0'	1.8'
						9	M.Dense					
		30.0' - 32.0'	D	6	9	12	Wet		Brown Silt, little fine Sand, lit-	5	2.0'	2.0'
						23	M.Dense		tle Fragments of Weathered Rock			
								32.0'	(Biotite Schist.			
									Bottom of Boring 32.0'			
									Installed 4" PVC Monitor Well at 29.5' with a .5 Stickup			
									15.0' Screen 1 Bag Initiator			
									15.0' Riser			
									1 Threaded Plug			
									1 Bag Voclay Grout			

GROUND SURFACE TO 30.0' USED HSA "CASING: THEN Sampled to 32.0'

Sample Type
D=Dry C=Cored W=Washed
UP=Undisturbed Piston
TP=Test Pit A=Auger V=Vane Test
UT=Undisturbed Thinwall

Proportions Used
trace 0 to 10%
little 10 to 20%
some 20 to 35%
and 35 to 50%

140lb Wt. x 30" fall on 2" O.D. Sampler

Cohesionless Density: 0-10 Loose; 10-30 Med. Dense; 30-50 Dense; 50+ Very Dense

Cohesive Consistency: 0-4 Soft; 4-8 M/Stiff; 8-15 Stiff; 15-30 V-Stiff; 30+ Hard

SUMMARY
Earth Boring 32.0'
Rock Coring ____
Samples 5

HOLE NO RW-3

East Coast Drilling & Boring, Inc.

P.O. BOX 961 • WALLINGFORD, CT 06492

Bit # ____ Ftg. ____

Bit # ____ Ftg. ____

SHEET 1 OF 1

DATE 7/11/91

HOLE NO. RW-4

LINE & STA. ____

OFFSET ____

TO Lincoln Applied Geology | ADDRESS Briston, VT

PROJECT NAME Dean's Mobil Station | LOCATION Bethel, VT

REPORT SENT TO Client | PROJ. NO. ____

SAMPLES SENT TO Taken at Site | OUR JOB NO. 91V-101

GROUND WATER OBSERVATIONS

At 17.5' after 0 Hours

At ____ after ____ Hours

	CASING	SAMPLER	CORE BAR.
Type	HSA	S-S	
Size I.D.	6 1/4"	1 3/8"	
Hammer Wt.		140lbs.	BIT
Hammer Fall		30"	

SURFACE ELEV. ____

DATE STARTED 7/10/91

DATE COMPL. 7/10/91

BORING FOREMAN Brett Swiatek

INSPECTOR Bill Norland

SOILS ENGR. ____

LOCATION OF BORING: ____

DEPTH	Casing Blows per foot	Sample Depths From - To	Type of Sample	Blows per 6" on Sampler From 0-6	To 6-12	To 12-18	Moisture Density or Consist.	Strata Change Elev.	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, condition, hardness, Drilling time, seams and etc.	SAMPLE No.	Pen	Rec.
									Augered to 10.0'			
		10.0' - 12.0'	D	1	1	1	Dry		Brown fine medium Sand, trace fine	1	2.0'	2.0'
						1	Loose		Gravel.			
		15.0' - 17.0'	D	4	4	4	Dry		Brown medium coarse Sand, little	2	2.0'	1.5'
						5	Loose		fine medium Gravel.			
		20.0' - 22.0'	D	5	6	9	Wet		Brown Silt, little fine Sand,	3	2.0'	2.0'
						7	M.Dense		(Slight Odor).			
								22.5'				
									Auger Refusal at 22.5'			
									Installed 4" PVC Monitor Well at			
									21.5' with a 2.0' Stickup			
									10.0' Screen			
									15.0' Riser			
									400lbs. Ottawa Sand			
									1 Threaded Plug			
									1 Bag Voclay Grout			
									1 Bag Initiator			

GROUND SURFACE TO 22.5' USED HSA "CASING: THEN Auger Refusal at 22.5'

Sample Type
D=Dry C=Cored W=Washed
UP=Undisturbed Piston
TP=Test Pit A=Auger V=Vane Test
UT=Undisturbed Thinwall

Proportions Used
trace 0 to 10%
little 10 to 20%
some 20 to 35%
and 35 to 50%

140lb Wt. x 30" fall on 2" O.D. Sampler

Cohesionless Density		Cohesive Consistency	
0-10	Loose	0-4	Soft
10-30	Med. Dense	4-8	M/Stiff
30-50	Dense	8-15	Stiff
50 +	Very Dense	15-30	V-Stiff
		30 +	Hard

SUMMARY:
Earth Boring 22.5'
Rock Coring ____
Samples 3

HOLE NO RW-4

APPENDIX D

Endyne Laboratory

Water Quality Reports

ENDYNE, INC.

Laboratory Services

32 James Brown Drive
Williston, Vermont 05495
(802) 879-4333
FAX 879-7103

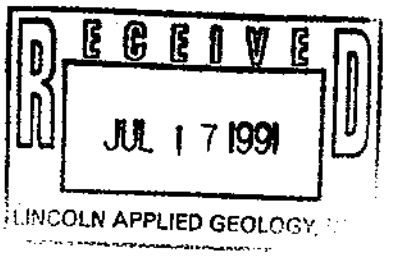
LABORATORY REPORT

GC METHOD -- BTEX (BENZENE, TOLUENE, ETHYLBENZENE, XYLENES)

CLIENT: Lincoln Applied Geology
PROJECT NAME: Deans Mobil
REPORT DATE: July 15, 1991
SAMPLER: Jim Holman
DATE SAMPLED: July 2, 1991
DATE RECEIVED: July 2, 1991

ANALYSIS DATE: July 11, 1991
STATION: MW 1
REF.#: 21,057
TIME SAMPLED: Not Indicated

Parameter	Concentration (ug/L)
Benzene	6,140.
Toluene	19,600.
Ethylbenzene	2,060.
Xylenes	17,200.
MTBE	2,800.



NUMBER OF UNIDENTIFIED PEAKS FOUND: 26

Reviewed by Suzanne Hendrickson

ENDYNE, INC.

Laboratory Services

32 James Brown Drive
Williston, Vermont 05495
(802) 879-4333
FAX 879-7103

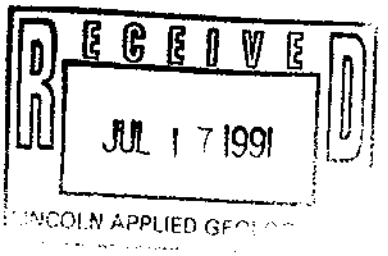
LABORATORY REPORT

GC METHOD -- BTEX (BENZENE, TOLUENE, ETHYLBENZENE, XYLENES)

CLIENT: Lincoln Applied Geology
PROJECT NAME: Deans Mobil
REPORT DATE: July 15, 1991
SAMPLER: Jim Holman
DATE SAMPLED: July 2, 1991
DATE RECEIVED: July 2, 1991

ANALYSIS DATE: July 11, 1991
STATION: MW 2
REF.#: 21,058
TIME SAMPLED: Not Indicated

Parameter	Concentration (ug/L)
Benzene	2.28
Toluene	6.62
Ethylbenzene	7.30
Xylenes	23.2
MTBE	20.2



NUMBER OF UNIDENTIFIED PEAKS FOUND: 2

Reviewed by Suzanne Stanton

ENDYNE, INC.

Laboratory Services

32 James Brown Drive
Williston, Vermont 05495
(802) 879-4333
FAX 879-7103

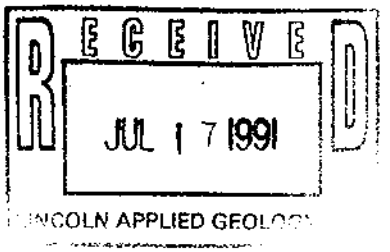
LABORATORY REPORT

GC METHOD -- BTEX (BENZENE, TOLUENE, ETHYLBENZENE, XYLENES)

CLIENT: Lincoln Applied Geology
PROJECT NAME: Deans Mobil
REPORT DATE: July 15, 1991
SAMPLER: Jim Holman
DATE SAMPLED: July 2, 1991
DATE RECEIVED: July 2, 1991

ANALYSIS DATE: July 11, 1991
STATION: MW 3
REF.#: 21,059
TIME SAMPLED: 10:30

Parameter	Concentration (ug/L)
Benzene	27.8
Toluene	65.4
Ethylbenzene	28.4
Xylenes	220.
MTBE	69.8



NUMBER OF UNIDENTIFIED PEAKS FOUND: 20

Reviewed by Suzanne Grendel

ENDYNE, INC.

Laboratory Services

32 James Brown Drive
Williston, Vermont 05495
(802) 879-4333
FAX 879-7103

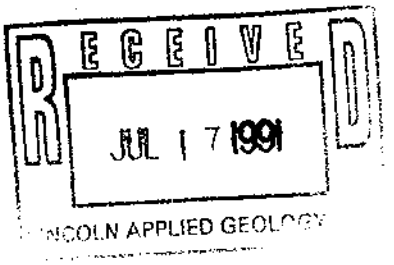
LABORATORY REPORT

GC METHOD -- BTEX (BENZENE, TOLUENE, ETHYLBENZENE, XYLENES)

CLIENT: Lincoln Applied Geology
PROJECT NAME: Deans Mobil
REPORT DATE: July 15, 1991
SAMPLER: Jim Holman
DATE SAMPLED: July 2, 1991
DATE RECEIVED: July 2, 1991

ANALYSIS DATE: July 11, 1991
STATION: MW 5
REF.#: 21,060
TIME SAMPLED: Not Indicated

Parameter	Concentration (ug/L)
Benzene	5,230.
Toluene	16,000.
Ethylbenzene	1,420.
Xylenes	10,200
MTBE	2,990.



NUMBER OF UNIDENTIFIED PEAKS FOUND: 11

Reviewed by Suzanne Stemkoski

ENDYNE, INC.

Laboratory Services

32 James Brown Drive
Williston, Vermont 05495
(802) 879-4333
FAX 879-7103

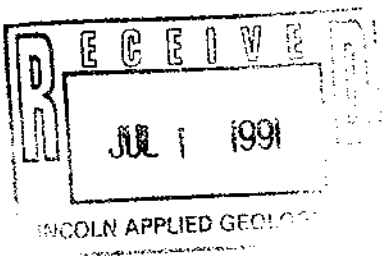
LABORATORY REPORT

GC METHOD -- BTEX (BENZENE, TOLUENE, ETHYLBENZENE, XYLENES)

CLIENT: Lincoln Applied Geology
PROJECT NAME: Deans Mobil
REPORT DATE: July 15, 1991
SAMPLER: Jim Holman
DATE SAMPLED: July 2, 1991
DATE RECEIVED: July 2, 1991

ANALYSIS DATE: July 11, 1991
STATION: MW 6
REF.#: 21,061
TIME SAMPLED: 10:00

Parameter	Concentration (ug/L)
Benzene	19.8
Toluene	24.0
Ethylbenzene	TBQ[1]
Xylenes	14.5
MTBE	19.4



NUMBER OF UNIDENTIFIED PEAKS FOUND: 3

NOTES:

1 Trace below quantitation limits

Reviewed by Suzanne Herrick

ENDYNE, INC.

Laboratory Services

32 James Brown Drive
Williston, Vermont 05495
(802) 879-4333
FAX 879-7103

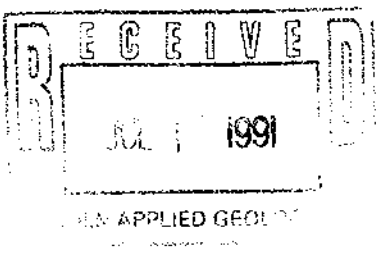
LABORATORY REPORT

GC METHOD -- BTEX (BENZENE, TOLUENE, ETHYLBENZENE, XYLENES)

CLIENT: Lincoln Applied Geology
PROJECT NAME: Deans Mobil
REPORT DATE: July 15, 1991
SAMPLER: Jim Holman
DATE SAMPLED: July 2, 1991
DATE RECEIVED: July 2, 1991

ANALYSIS DATE: July 11, 1991
STATION: MW 7
REF.#: 21,062
TIME SAMPLED: 10:15

Parameter	Concentration (ug/L)
Benzene	ND [1]
Toluene	ND
Ethylbenzene	ND
Xylenes	ND
MTBE	ND



NUMBER OF UNIDENTIFIED PEAKS FOUND: 0

NOTES:

1 Compound not detected in analysis

Reviewed by Suzanne Grendahl

ENDYNE, INC.

Laboratory Services

32 James Brown Drive
Williston, Vermont 05495
(802) 879-4333
FAX 879-7103

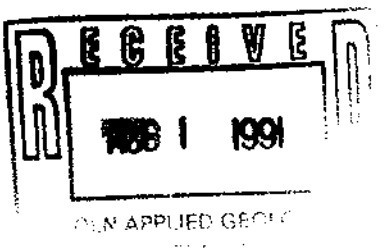
LABORATORY REPORT

GC METHOD -- BTEX (BENZENE, TOLUENE, ETHYLBENZENE, XYLENES)

CLIENT: LAG
PROJECT NAME: Dean's Mobil
REPORT DATE: August 6, 1991
SAMPLER: J. Holman
DATE SAMPLED: July 22, 1991
DATE RECEIVED: July 22, 1991

ANALYSIS DATE: July 30, 1991
STATION: Influent
REF.#: 21759
TIME SAMPLED: 10:00

Parameter	Concentration (ug/L)
Benzene	ND [1]
Toluene	ND
Ethylbenzene	ND
Xylenes	ND
MTBE	179.



NUMBER OF UNIDENTIFIED PEAKS FOUND: 1

NOTES:

1 Compound not detected in analysis

Reviewed by _____

ENDYNE, INC.

Laboratory Services

32 James Brown Drive
Williston, Vermont 05495
(802) 879-4333
FAX 879-7103

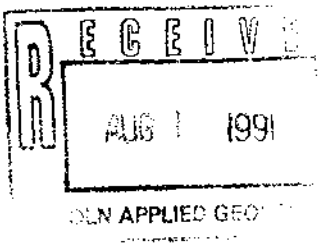
LABORATORY REPORT

GC METHOD -- BTEX (BENZENE, TOLUENE, ETHYLBENZENE, XYLENES)

CLIENT: LAG
PROJECT NAME: Dean's Mobil
REPORT DATE: August 6, 1991
SAMPLER: J. Holman
DATE SAMPLED: July 22, 1991
DATE RECEIVED: July 22, 1991

ANALYSIS DATE: July 30, 1991
STATION: Effluent 1A
REF.#: 21760
TIME SAMPLED: 10:00

Parameter	Concentration (ug/L)
Benzene	ND [1]
Toluene	ND
Ethylbenzene	ND
Xylenes	ND
MTBE	ND



NUMBER OF UNIDENTIFIED PEAKS FOUND: 1

NOTES:

1 Compound not detected in analysis

Reviewed by _____

ENDYNE, INC.

Laboratory Services

32 James Brown Drive
Williston, Vermont 05495
(802) 879-4333
FAX 879-7103

LABORATORY REPORT

GC METHOD -- BTEX (BENZENE, TOLUENE, ETHYLBENZENE, XYLENES)

CLIENT: LAG
PROJECT NAME: Dean's Mobil
REPORT DATE: August 6, 1991
SAMPLER: J. Holman
DATE SAMPLED: July 22, 1991
DATE RECEIVED: July 22, 1991

ANALYSIS DATE: July 30, 1991
STATION: Effluent 1B
REF.#: 21761
TIME SAMPLED: 10:00

Parameter	Concentration (ug/L)
Benzene	ND [1]
Toluene	ND
Ethylbenzene	ND
Xylenes	ND
MTBE	ND

NUMBER OF UNIDENTIFIED PEAKS FOUND: 1

NOTES:

1 Compound not detected in analysis

Reviewed by _____

ENDYNE, INC.

Laboratory Services

32 James Brown Drive
Williston, Vermont 05495
(802) 879-4333
FAX 879-7103

LABORATORY REPORT

GC METHOD -- BTEX (BENZENE, TOLUENE, ETHYLBENZENE, XYLENES)

CLIENT: LAG
PROJECT NAME: Dean's Mobil
REPORT DATE: August 6, 1991
SAMPLER: J. Holman
DATE SAMPLED: July 22, 1991
DATE RECEIVED: July 22, 1991

ANALYSIS DATE: July 30, 1991
STATION: Total Effluent
REF.#: 21762
TIME SAMPLED: 10:00

Parameter	Concentration (ug/L)
Benzene	ND [1]
Toluene	ND
Ethylbenzene	ND
Xylenes	ND
MTBE	ND

NUMBER OF UNIDENTIFIED PEAKS FOUND: 1

NOTES:

1 Compound not detected in analysis

Reviewed by _____

ENDYNE, INC.

Laboratory Services

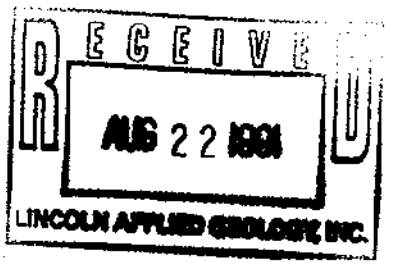
32 James Brown Drive
Williston, Vermont 05495
(802) 879-4333
FAX 879-7103

LABORATORY REPORT

GC METHOD -- BTEX (BENZENE, TOLUENE, ETHYLBENZENE, XYLENES)

CLIENT: Lincoln Applied Geology
PROJECT NAME: Dean's Mobil
REPORT DATE: August 21, 1991
SAMPLER: J. Holman
DATE SAMPLED: August 9, 1991
DATE RECEIVED: August 9, 1991
ANALYSIS DATE: August 15, 1991
STATION: Influent
REF.#: 22,588
TIME SAMPLED: 1:05

Parameter	Concentration (ug/L)
Benzene	3.51
Toluene	TBQ [2]
Ethylbenzene	ND [1]
Xylenes	55.4
MTBE	156.



NUMBER OF UNIDENTIFIED PEAKS FOUND: 3

NOTES:

1 Compound not detected in analysis
2 Trace below quantitation limit

Reviewed by _____

ENDYNE, INC.

Laboratory Services

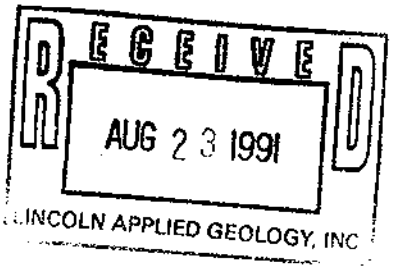
32 James Brown Drive
Williston, Vermont 05495
(802) 879-4333
FAX 879-7103

LABORATORY REPORT

GC METHOD -- BTEX (BENZENE, TOLUENE, ETHYLBENZENE, XYLENES)

CLIENT: Lincoln Applied Geology
PROJECT NAME: Dean's Mobil
REPORT DATE: August 21, 1991 ANALYSIS DATE: August 15, 1991
SAMPLER: J. Holman STATION: Effluent 1A
DATE SAMPLED: August 9, 1991 REF.#: 22,589
DATE RECEIVED: August 9, 1991 TIME SAMPLED: 1:05

Parameter	Concentration (ug/L)
Benzene	ND [1]
Toluene	ND
Ethylbenzene	ND
Xylenes	ND
MTBE	ND



NUMBER OF UNIDENTIFIED PEAKS FOUND: 1

NOTES:

1 Compound not detected in analysis

Reviewed by _____

ENDYNE, INC.

Laboratory Services

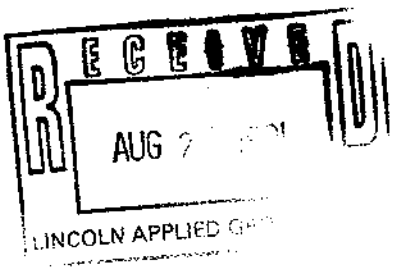
32 James Brown Drive
Williston, Vermont 05495
(802) 879-4333
FAX 879-7103

LABORATORY REPORT

GC METHOD -- BTEX (BENZENE, TOLUENE, ETHYLBENZENE, XYLENES)

CLIENT: Lincoln Applied Geology
PROJECT NAME: Dean's Mobil
REPORT DATE: August 21, 1991 ANALYSIS DATE: August 15, 1991
SAMPLER: J. Holman STATION: Effluent 1B
DATE SAMPLED: August 9, 1991 REF.#: 22,590
DATE RECEIVED: August 9, 1991 TIME SAMPLED: 1:05

Parameter	Concentration (ug/L)
Benzene	ND [1]
Toluene	ND
Ethylbenzene	ND
Xylenes	ND
MTBE	ND



NUMBER OF UNIDENTIFIED PEAKS FOUND: 1

NOTES:

1 Compound not detected in analysis

Reviewed by _____

ENDYNE, INC.

Laboratory Services

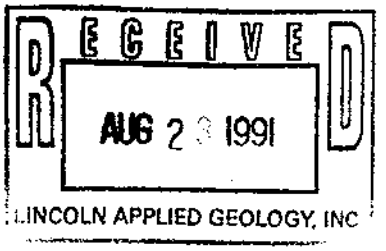
32 James Brown Drive
Williston, Vermont 05495
(802) 879-4333
FAX 879-7103

LABORATORY REPORT

GC METHOD -- BTEX (BENZENE, TOLUENE, ETHYLBENZENE, XYLENES)

CLIENT: Lincoln Applied Geology
PROJECT NAME: Dean's Mobil
REPORT DATE: August 21, 1991 ANALYSIS DATE: August 15, 1991
SAMPLER: J. Holman STATION: Total Effluent
DATE SAMPLED: August 9, 1991 REF.#: 22,591
DATE RECEIVED: August 9, 1991 TIME SAMPLED: 1:05

Parameter	Concentration (ug/L)
Benzene	ND [1]
Toluene	ND
Ethylbenzene	ND
Xylenes	ND
MTBE	ND



NUMBER OF UNIDENTIFIED PEAKS FOUND: 1

NOTES:

1 Compound not detected in analysis

Reviewed by _____

APPENDIX E

1272 Order
No. 7-9109

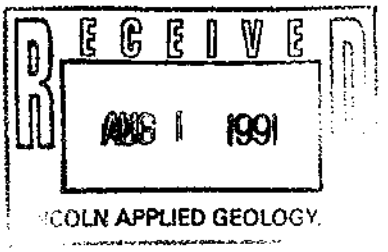
State of Vermont

AGENCY OF NATURAL RESOURCES
Department of Environmental Conservation

Department of Fish and Wildlife
Department of Forests, Parks and Recreation
Department of Environmental Conservation
State Geologist
Natural Resources Conservation Council

Permits, Compliance & Protection
Annex Building
103 South Main Street
Waterbury, VT 05671-0405
(802) 244-5674

August 9, 1991



Bradford Oil Company, Inc.
Attn: William Sellinger
P.O. Box 394
Bradford, VT 05033

RE: 1272 Order No. 7-9109

Dear Mr. Sellinger,

Enclosed is your copy of the above referenced 1272 Order, which has been signed by the Commissioner of the Department of Environmental Conservation, Agency of Natural Resources. We have issued the Order to authorize the treatment and discharge of gasoline-contaminated groundwater from the your site remediation project located at Dean's Mobil, Bethel, to the Third Branch of the White River via the municipal storm sewer.

Please read the entire Order carefully and become familiar with all its terms and conditions. In addition, please take note of the conditions which may require written responses by certain dates.

If you have any questions concerning this Order or other issues regarding this discharge, please do not hesitate to contact me.

Sincerely,

for Brian D. Kooiker
Chief, Permits & Compliance

Enclosure
cc.
Bill Norland, Lincoln Applied Geology✓
Chuck Schwer, VT DEC, Hazardous Materials Mgmt.
Springfield Act 250 Office

1272 ORDER

No. 7-9109

AGENCY OF NATURAL RESOURCES
DEPARTMENT OF ENVIRONMENTAL CONSERVATION

IN THE MATTER OF: Bradford Oil Company, Inc.
Box 394
Bradford, VT 05033

FINDINGS OF FACT

1. Bradford Oil Company, Inc. (Bradford Oil) owns an underground gasoline storage tank located at Dean's Mobil, Main Street, Route 12, Bethel, VT.

2. A leak was discovered in the underground gasoline storage tank and a significant amount of gasoline was discovered in monitoring wells in the vicinity of the underground storage tank area.

3. Bradford Oil has hired Lincoln Applied Geology (LAG) to investigate the groundwater contamination problem and to develop plans and procedures to pump, collect, and treat the gasoline contaminated groundwater.

4. LAG has installed a recovery wells and has proposed a remediation system for the site that consists of a free product recovery system, a groundwater depression pumps, an oil-water separator, and two canisters of granular activated carbon linked in series.

5. The activated carbon is capable of treating the contaminated groundwater such that the concentration of benzene is less than 5 ppb, the combined concentration of benzene, toluene, ethylbenzene, and xylenes (BTEX) is less than 50 ppb, and the concentration of petroleum hydrocarbons, as measured by EPA method 418.1, is less than 1 ppm.

6. The proposed remediation system is designed to collect and treat approximately 10 gallons per minute (14,400 gallons per day) with a maximum treatment capacity of 20 gallons per minute (28,800 gallons per day).

7. Bradford Oil has requested authorization from the Department of Environmental Conservation to discharge the treated groundwater to the Third Branch of the White River, via the Bethel Municipal Storm Sewer.

In accordance with the provisions of 10 V.S.A. Section 1272, the Secretary ("Secretary"), based on the findings of fact, hereby issues the following:

ORDER

The proposed discharge of treated contaminated groundwater by Bradford Oil constitutes an activity that is subject to Title 10, Chapter 47, Section 1272. The Secretary hereby authorizes Bradford Oil to discharge treated contaminated groundwater to the Third Branch of the White River according to the following conditions:

1) Bradford Oil or their consultant, shall operate and maintain the groundwater collection and treatment system such that the concentration of benzene discharged to the Third Branch of the White River does not exceed 5 ppb, the combined concentration of benzene, toluene, ethylbenzene, and xylenes (BTEX) does not exceed 50 ppb, and the concentration of petroleum hydrocarbons, as measured by EPA method 418.1, does not exceed 1 ppm.

2) Bradford Oil or their consultant, shall discharge the treated groundwater to the Third Branch of the White River and shall limit the volume discharged to a maximum of 28,800 gallons per day.

3) Bradford Oil or their consultant, shall collect and analyze the contaminated and treated groundwater at a frequency of twice per month. These samples shall be collected from the influent to the activated carbon treatment system, the effluent from the first carbon canister, and from the effluent from the treatment system. BTEX shall be measured as the sum of benzene, ethylbenzene, toluene, and xylenes. Samples shall be analyzed according to EPA method 602 protocol. Additionally, once per month, Bradford Oil Company, Inc., or their consultant, shall collect and analyze the contaminated and treated groundwater for petroleum hydrocarbons, according to EPA method 418.1.

4) Bradford Oil or their consultant, shall replace the first carbon adsorption canister prior to breakthrough of dissolved hydrocarbons. The time of breakthrough shall be calculated based on flow data developed from pump tests and analysis of untreated contaminated groundwater. The calculated breakthrough time shall be utilized as a schedule for replacing and rotating the carbon adsorption units unless ongoing analyses demonstrate that a different breakthrough time interval is appropriate in order to consistently meet the effluent limitations specified in Condition 1 above.

5) Should the discharge exceed the effluent limitations (specified in condition 1 above) at any time, Bradford Oil or their consultant, shall:

   a) Notify the Permits and Compliance Section (244-5674) within 24 hours.
   b) Submit a written report within 5 days detailing the reason(s) for the violation and the procedures to be employed so that the discharge will once again be in compliance with the effluent limitations.

   The Department of Environmental Conservation will evaluate the situation on a case-by-case basis and may require Bradford Oil to cease discharging until such time as treatment has been restored to a level that will consistently meet the effluent standards.

6) The results of all discharge monitoring shall be submitted monthly, to be received by the 15th of the month, to the following address:

   Vermont Agency of Natural Resources
   Permits, Compliance and Protection Division
   The Annex Building
   103 South Main Street
   Waterbury, Vermont 05676

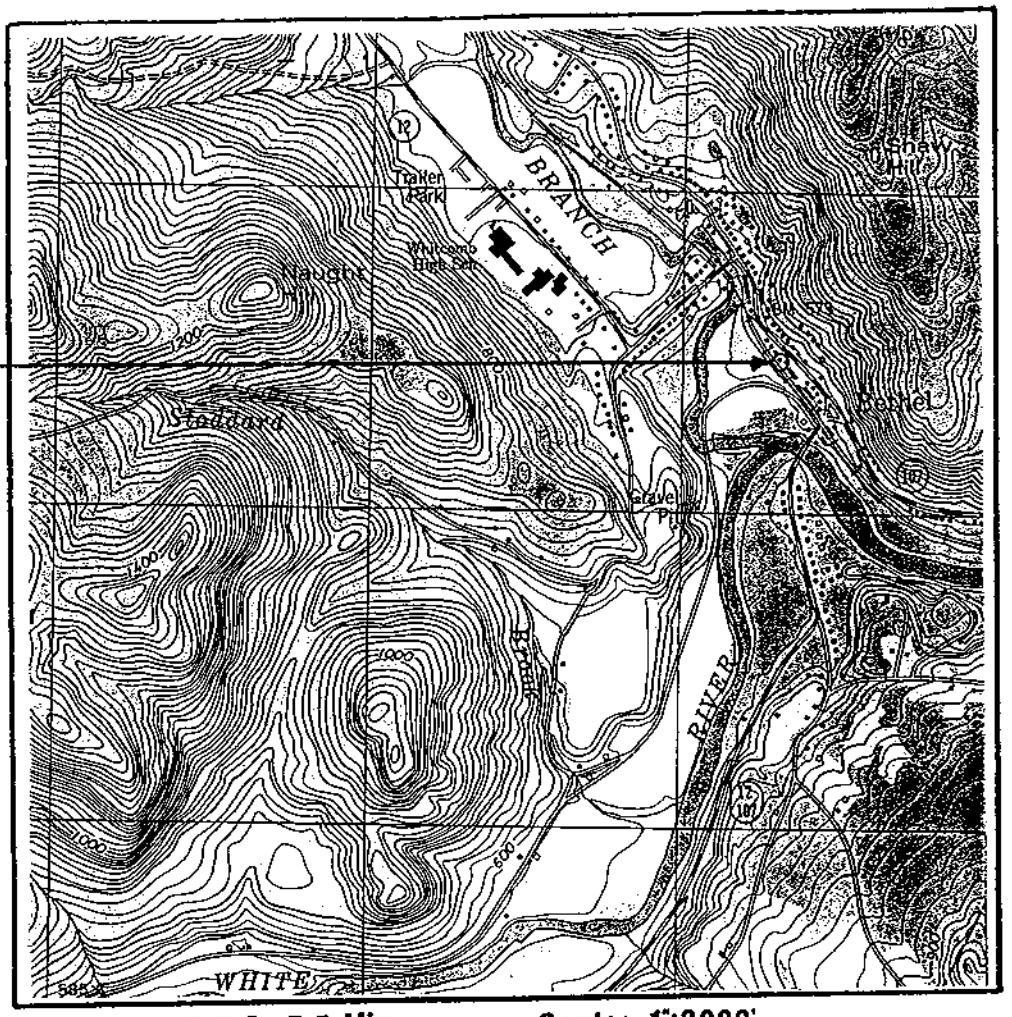
7) Since it is predictable that this discharge of treated groundwater will continue beyond December 31, 1991, Bradford Oil shall apply for a discharge permit by December 31 1991.

8) This Order and the authorization to discharge expires on June 30, 1992.

Signed this 9th Day of August, 1991

William C Bruley for RAL
Reginald A. LaRosa, Acting Commissioner
Department of Environmental Conservation

GENERAL LOCATION MAP

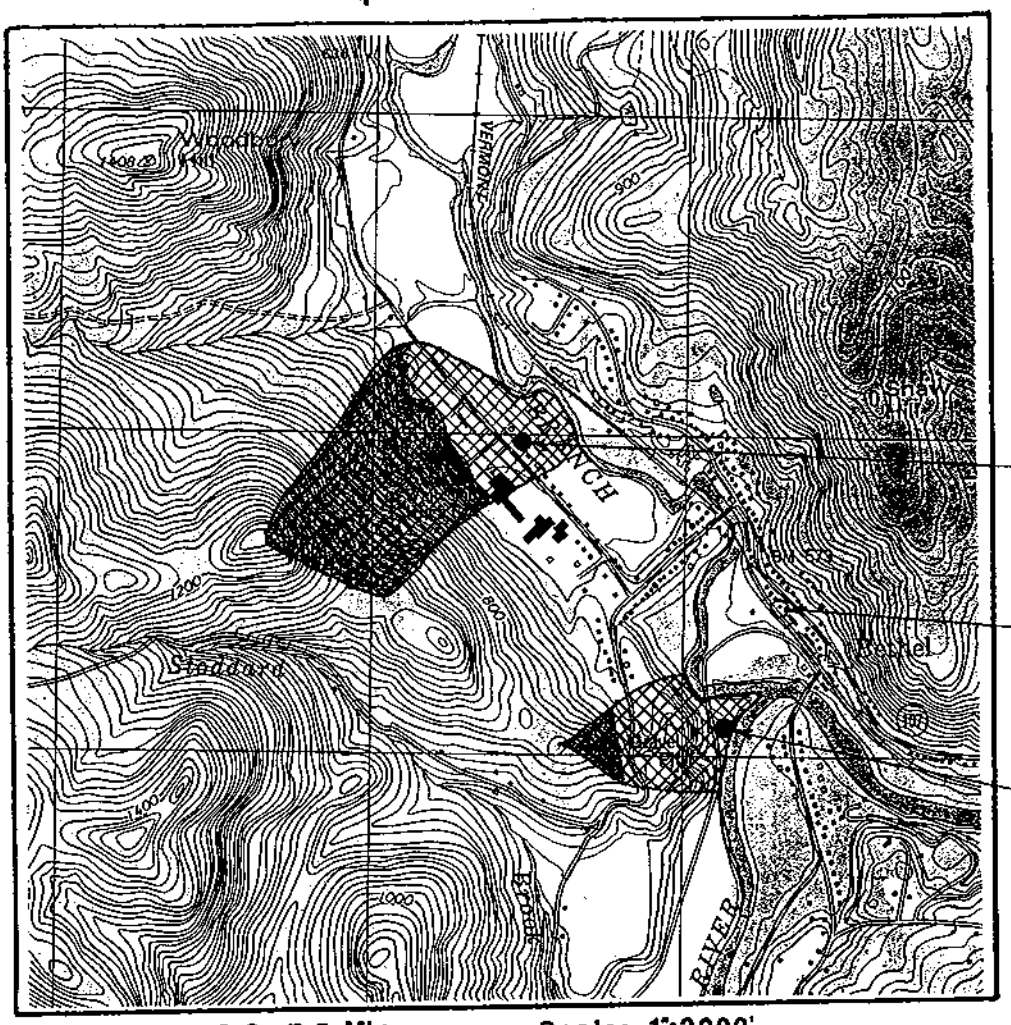


Source: U.S.G.S. 7.5 Min. Topo. Series Bethel Quad

Scale: 1":2000'

Sites 911058 and 961058

Bethel Water Department
Class II Zone
Aquifer Protection Areas



Source: U.S.G.S. 7.5 Min. Topo. Series Bethel Quad

Scale: 1":2000'

Primary Zone

Secondary Zone

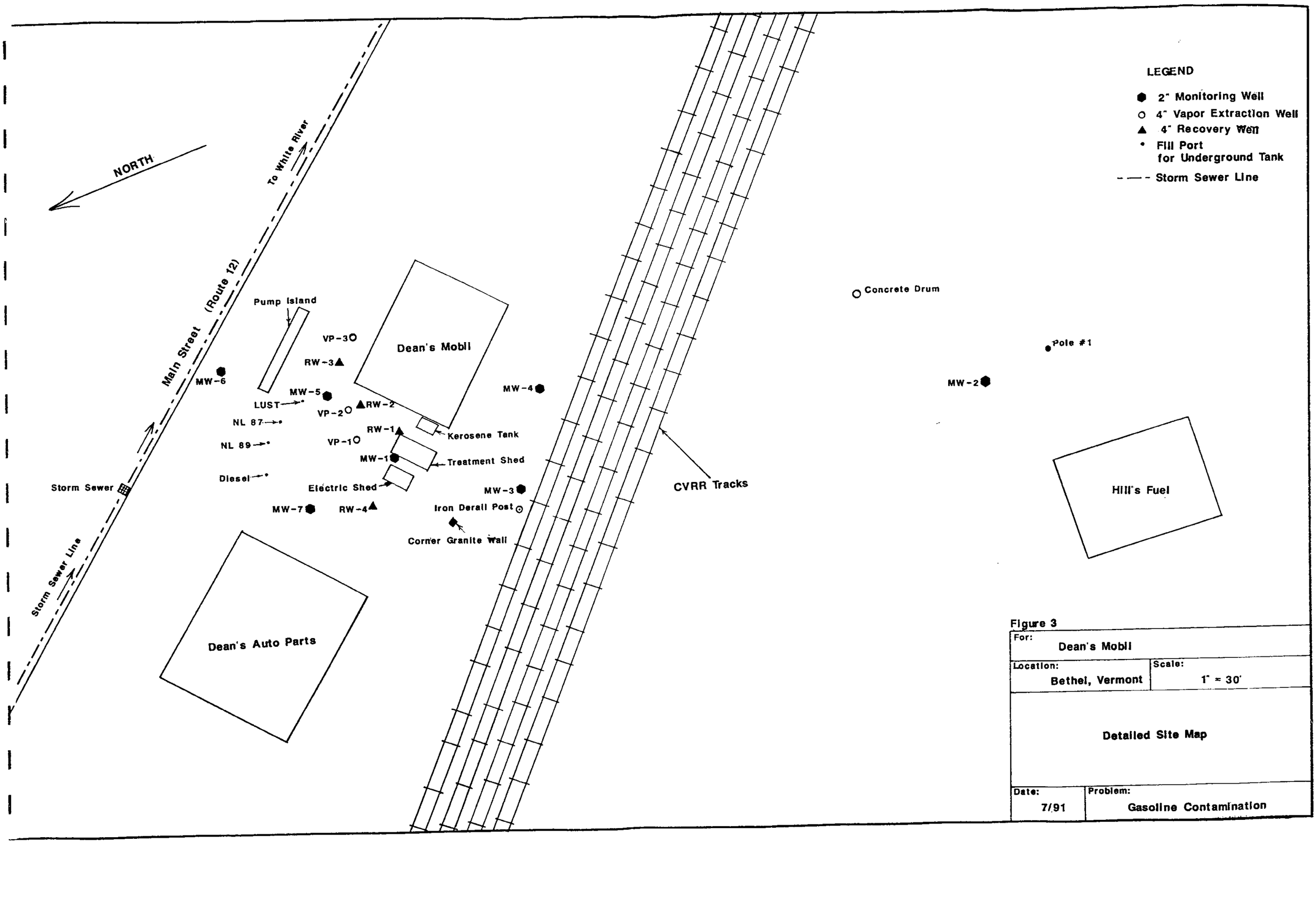


Figure 3

For: Dean's Mobil	
Location: Bethel, Vermont	Scale: 1" = 30'
Detailed Site Map	
Date: 7/91	Problem: Gasoline Contamination

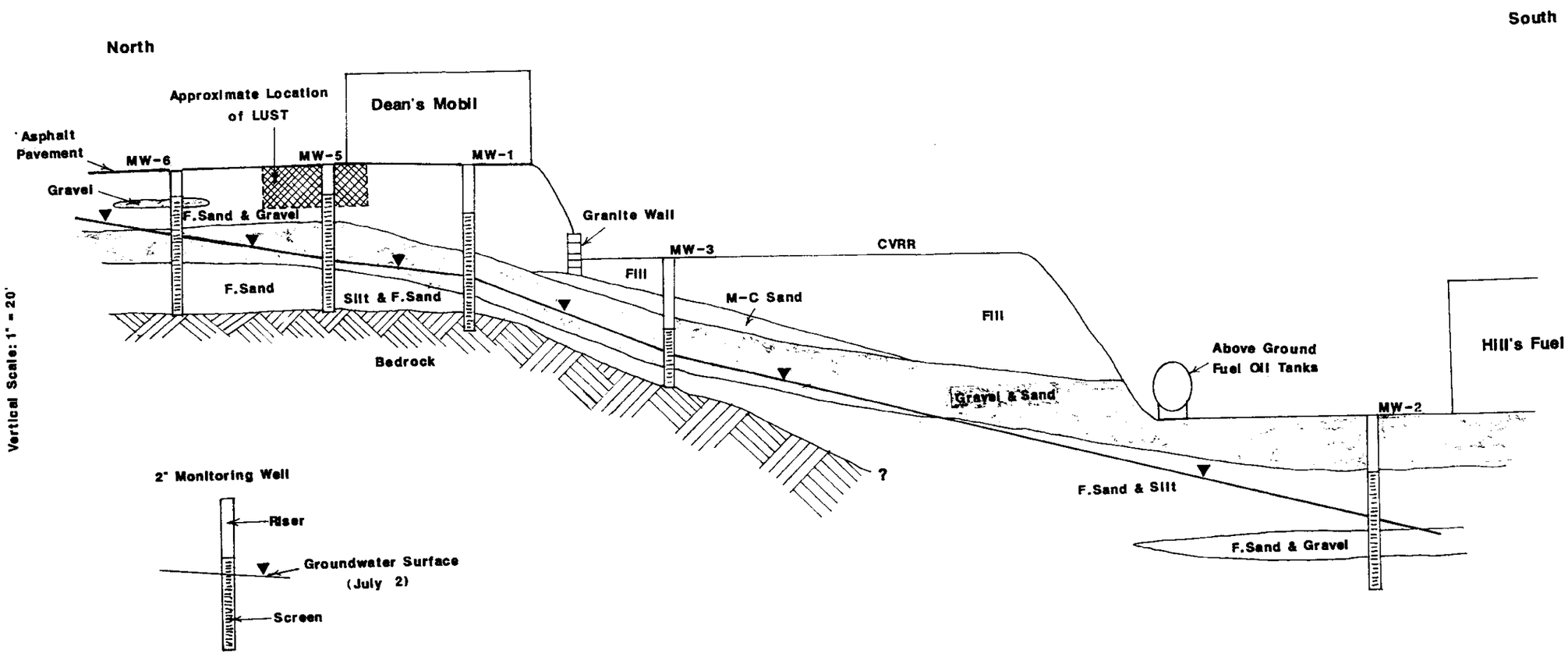


Figure 4

For: Dean's Mobil	
Location: Bethel, Vermont	Scale: As Shown
Schematic Cross Section from MW-6 to MW-2 (North to South) Showing Geology, Groundwater Surface and Buildings July 2	
Date: July 1991	Problem: Gasoline Contamination

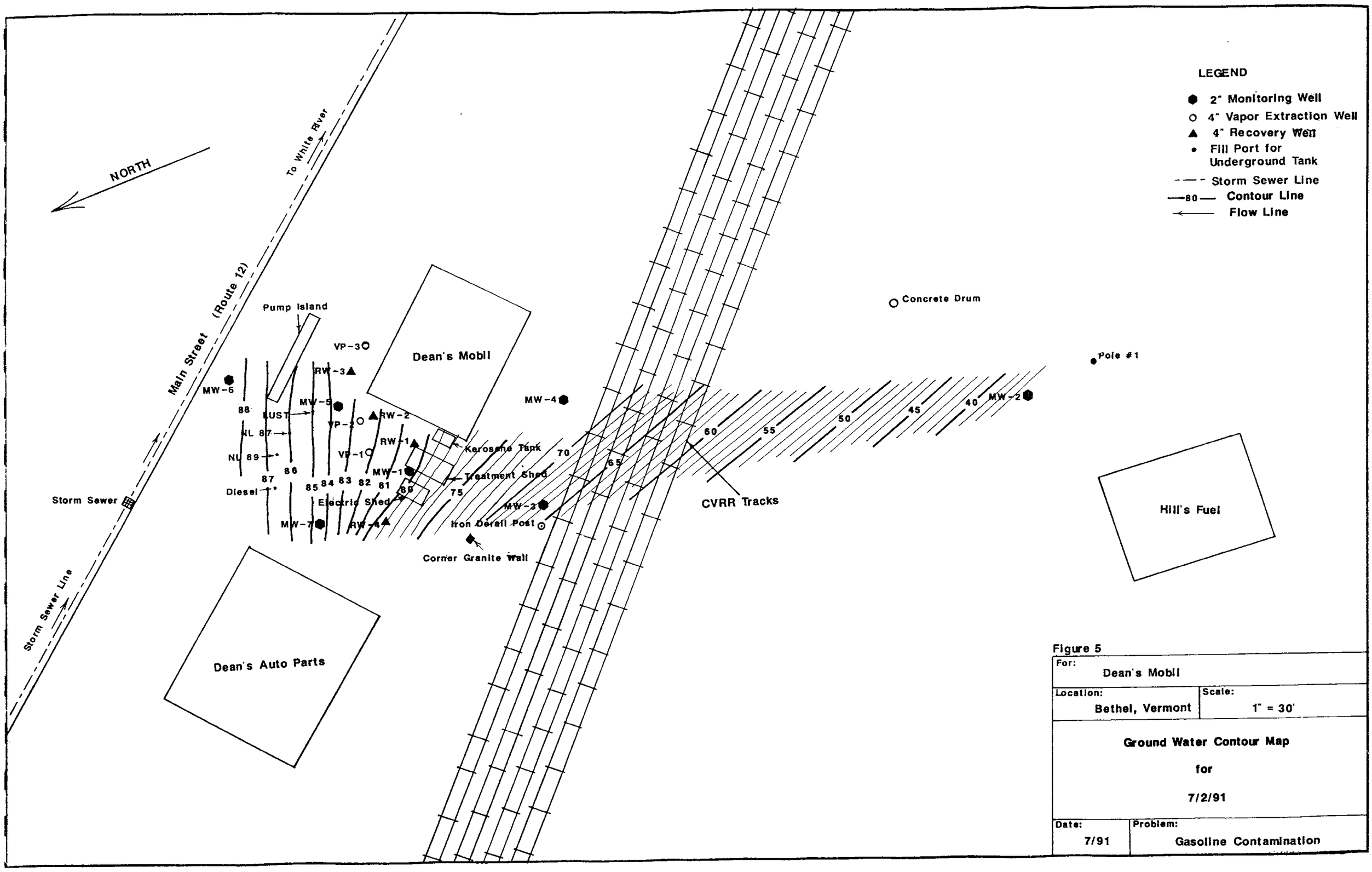
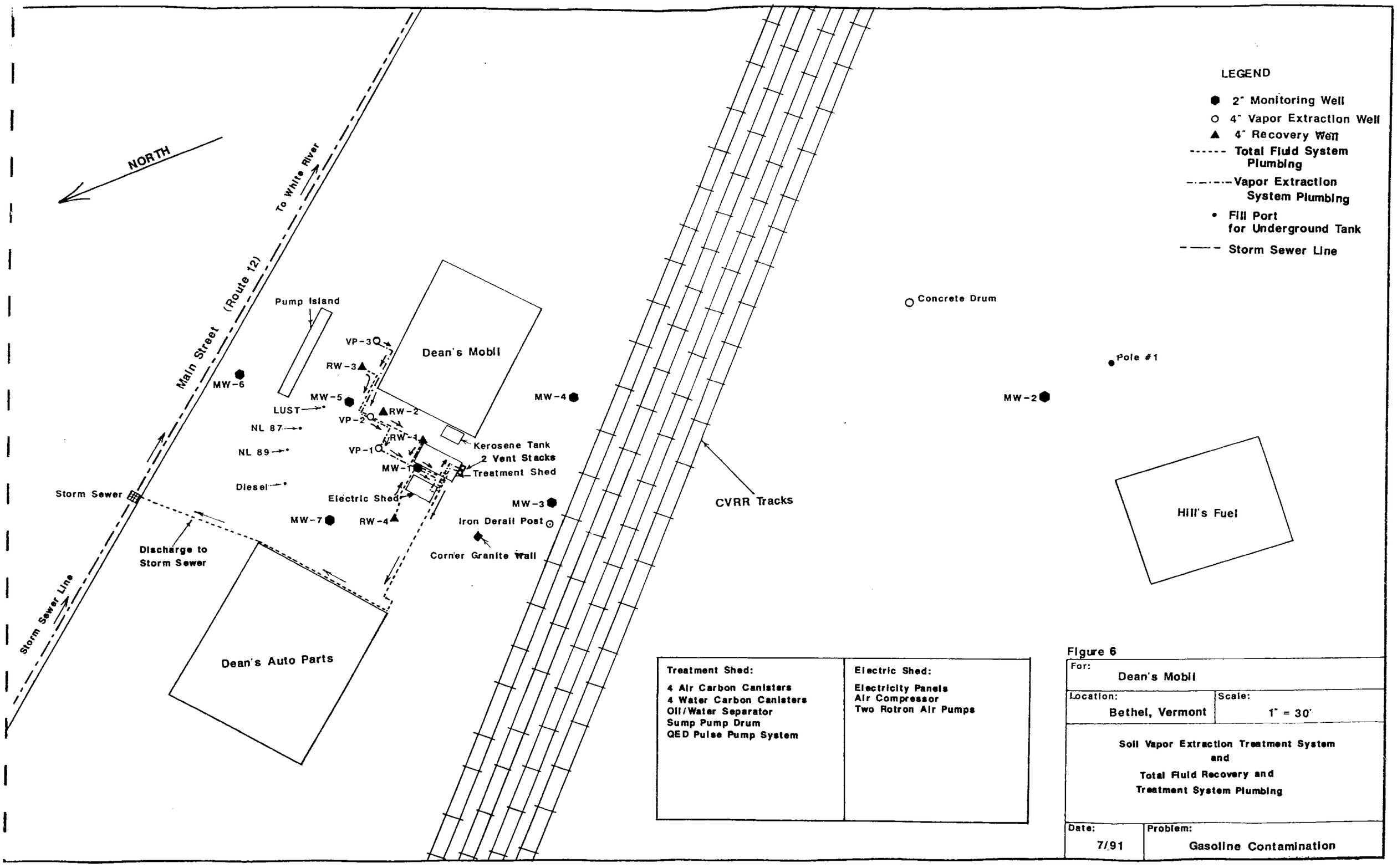


Figure 5

For: Dean's Mobil	
Location: Bethel, Vermont	Scale: 1" = 30'
Ground Water Contour Map for 7/2/91	
Date: 7/91	Problem: Gasoline Contamination



Treatment Shed:	Electric Shed:
4 Air Carbon Canisters 4 Water Carbon Canisters Oil/Water Separator Sump Pump Drum QED Pulse Pump System	Electricity Panels Air Compressor Two Rotron Air Pumps

Figure 6

For: Dean's Mobil	
Location: Bethel, Vermont	Scale: 1" = 30'
Soil Vapor Extraction Treatment System and Total Fluid Recovery and Treatment System Plumbing	
Date: 7/91	Problem: Gasoline Contamination

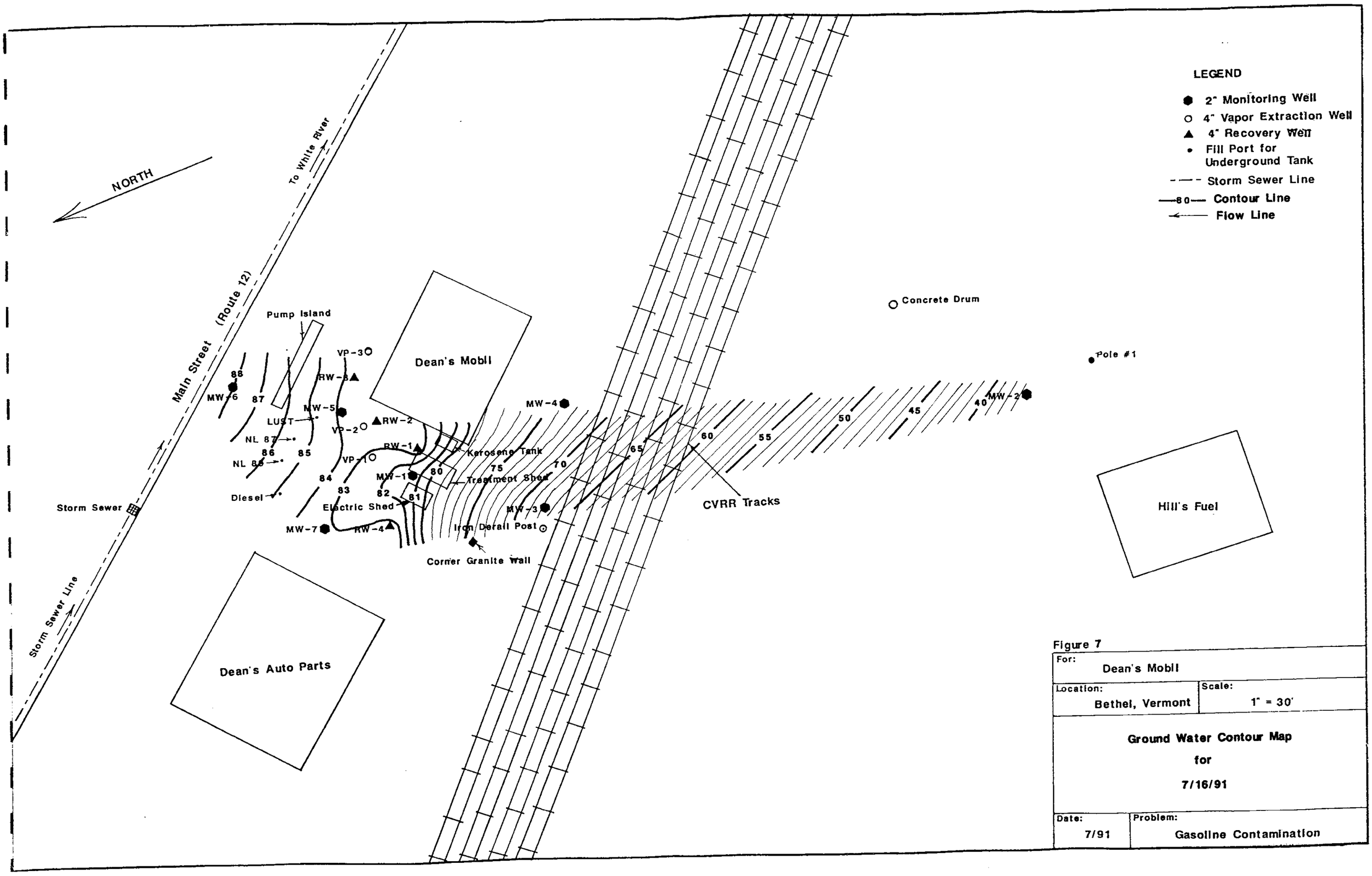


Figure 7

For: Dean's Mobil	
Location: Bethel, Vermont	Scale: 1" = 30'
Ground Water Contour Map for 7/16/91	
Date: 7/91	Problem: Gasoline Contamination

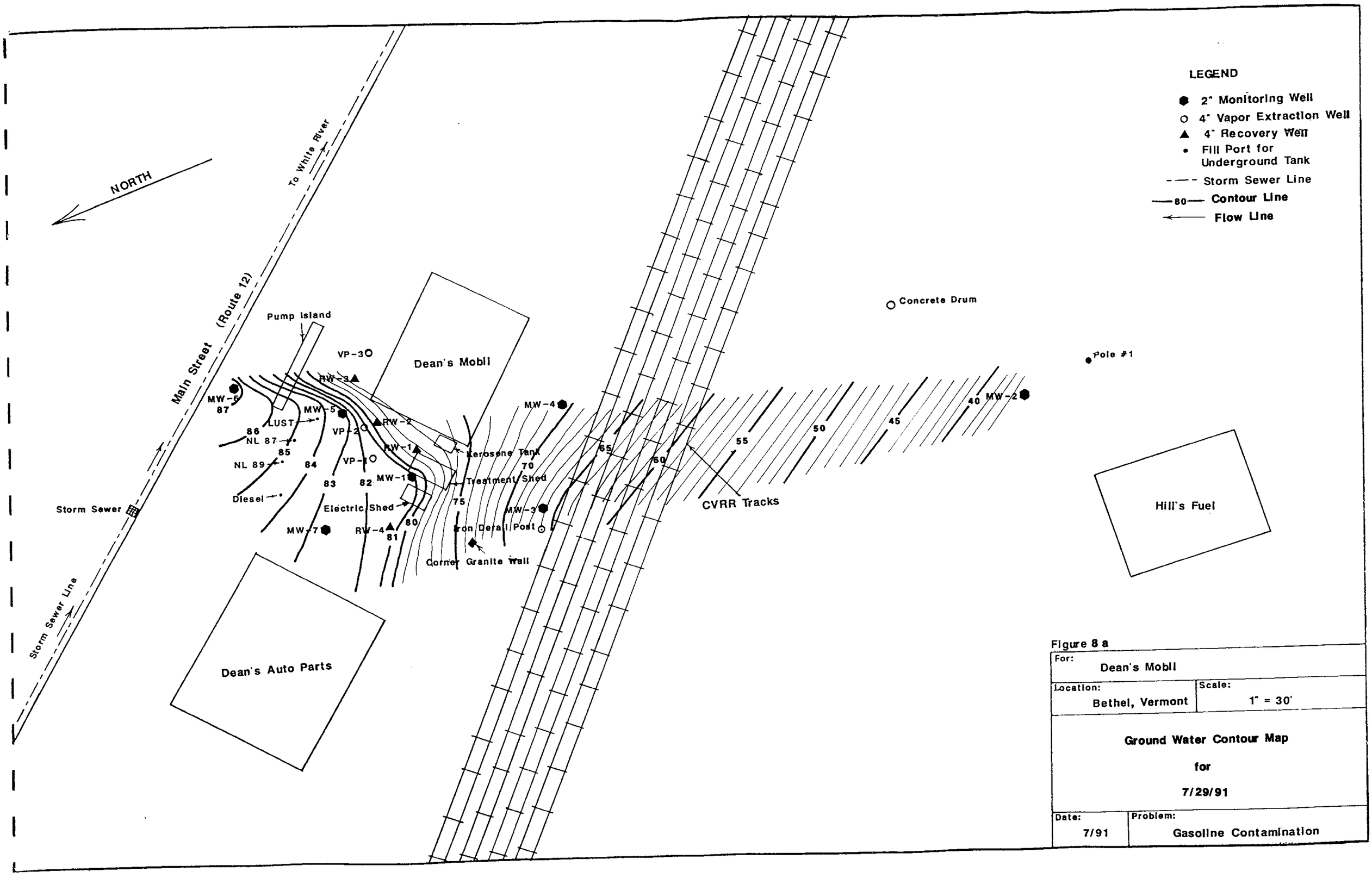


Figure 8 a

For: Dean's Mobil	
Location: Bethel, Vermont	Scale: 1" = 30'
Ground Water Contour Map for 7/29/91	
Date: 7/91	Problem: Gasoline Contamination

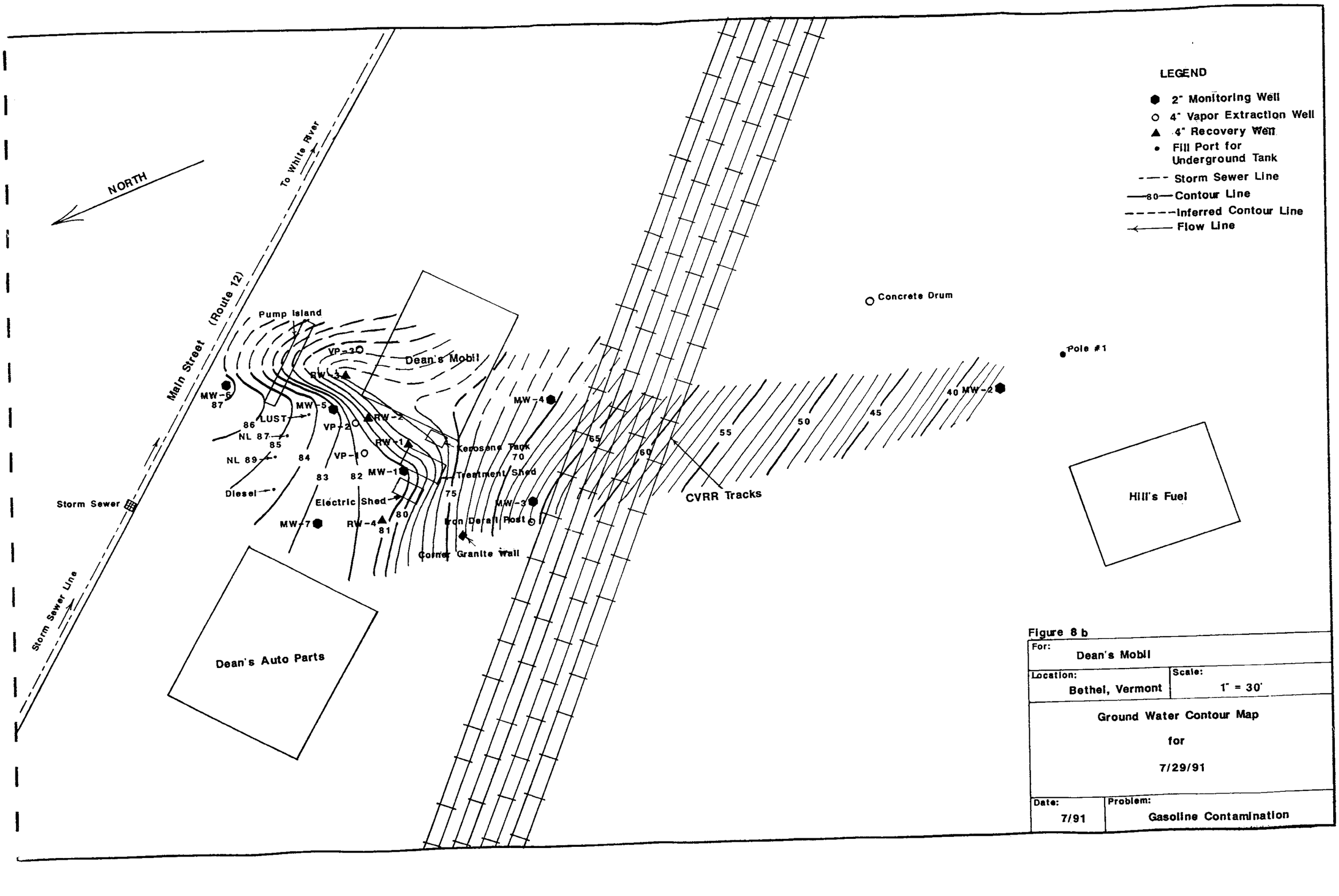


Figure 8 b

For: Dean's Mobil	
Location: Bethel, Vermont	Scale: 1" = 30'
Ground Water Contour Map for 7/29/91	
Date: 7/91	Problem: Gasoline Contamination

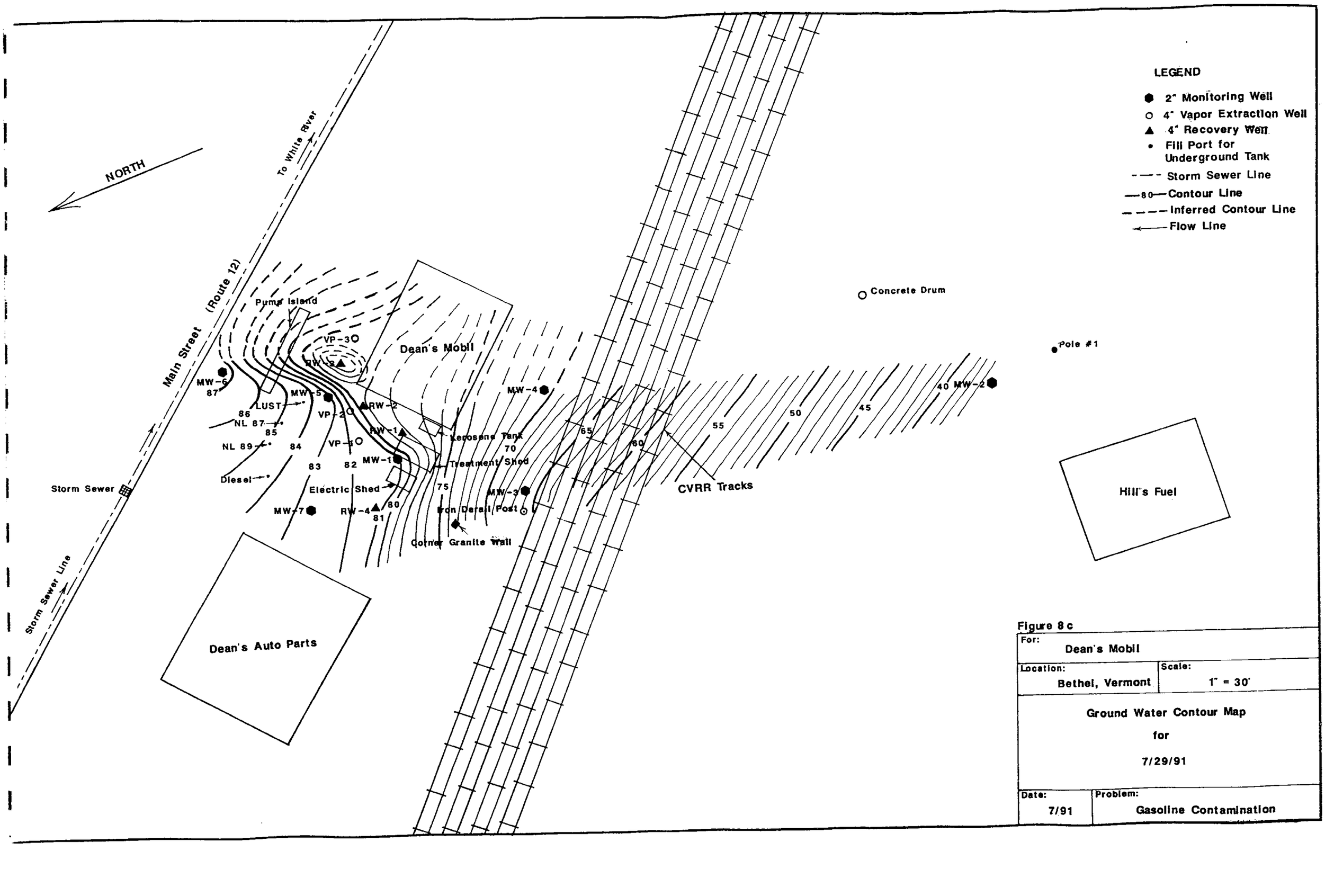


Figure 8 c

For: Dean's Mobil	
Location: Bethel, Vermont	Scale: 1" = 30'
Ground Water Contour Map for 7/29/91	
Date: 7/91	Problem: Gasoline Contamination

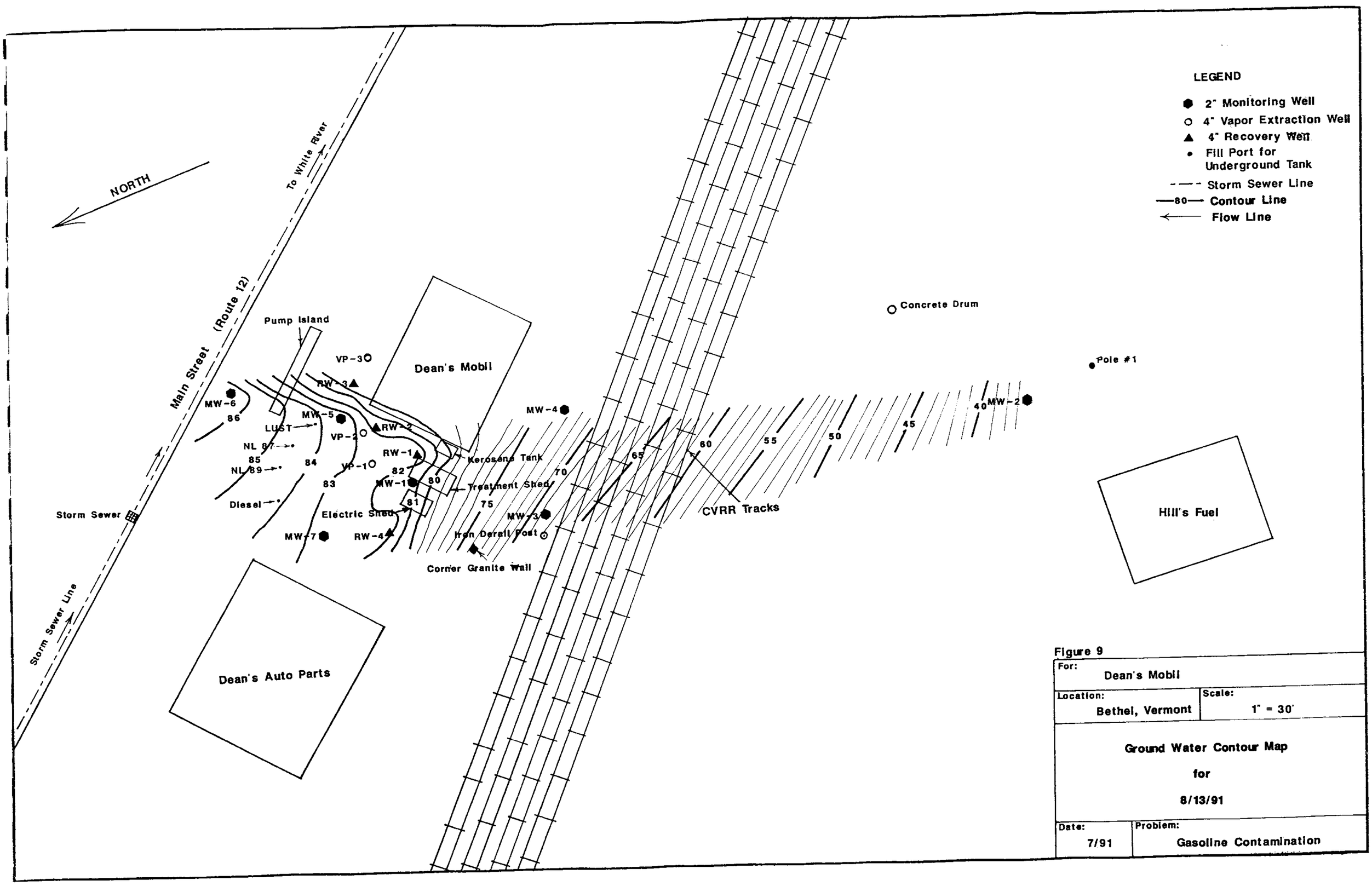


Figure 9

For: Dean's Mobil	
Location: Bethel, Vermont	Scale: 1" = 30'
Ground Water Contour Map for 8/13/91	
Date: 7/91	Problem: Gasoline Contamination

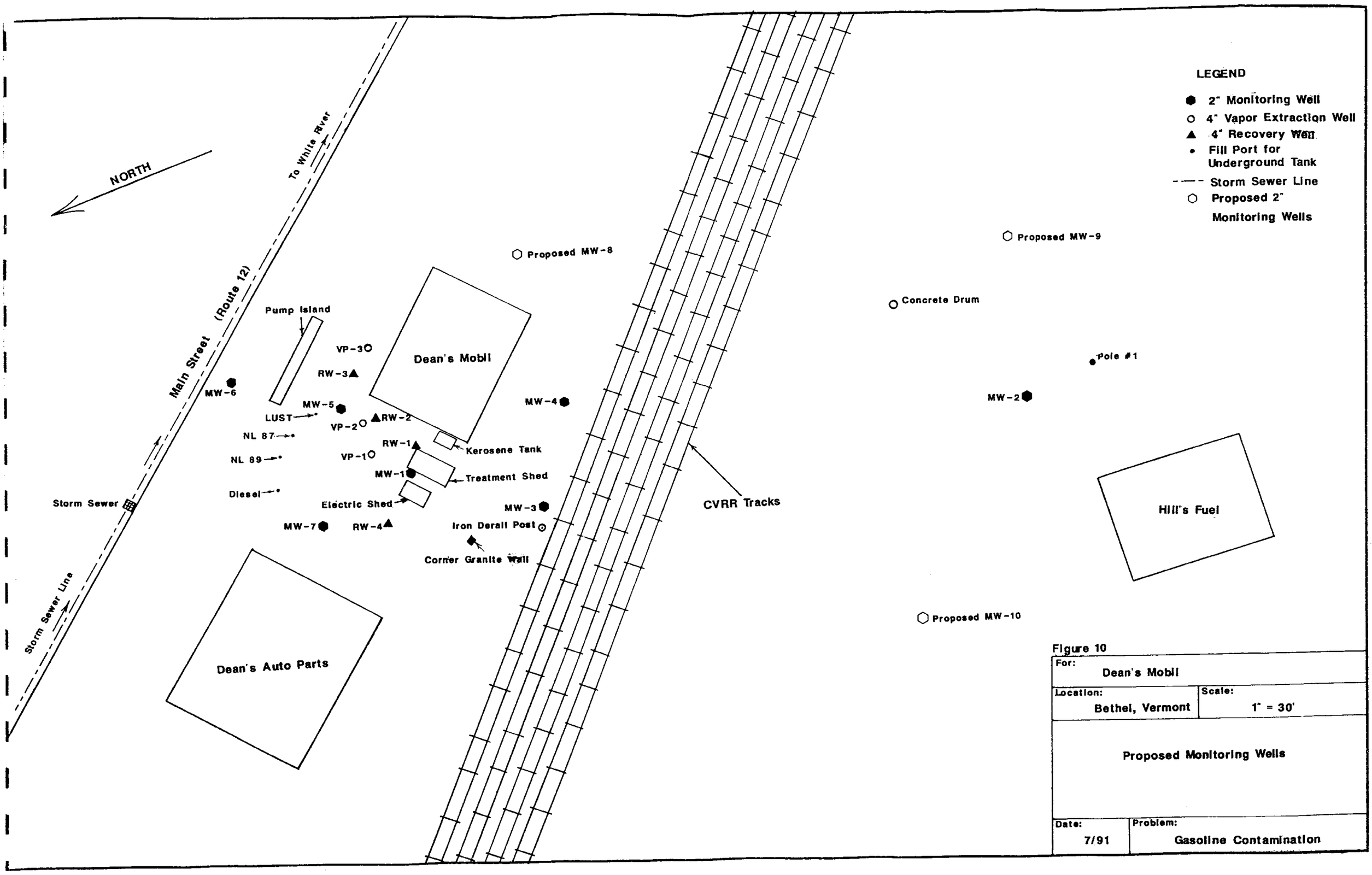


Figure 10

For: Dean's Mobil	
Location: Bethel, Vermont	Scale: 1" = 30'
Proposed Monitoring Wells	
Date: 7/91	Problem: Gasoline Contamination